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## THE GRAMINEAE-PANICOIDEAE OF NEW GUINEA

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*Concluded from page 319*

### Tribe II. ANDROPOGONEAE

Spikelets 2-flowered, the lower floret often reduced, in pairs (rarely in threes or solitary), one of the pair sessile, the other pediceled, both spikelets similar or more often dissimilar, the sessile spikelet then usually pistillate or perfect and the pediceled staminate or neuter, rarely wanting and only the pedicel remaining (in *Sclerandrium* the sessile spikelets staminate and the pediceled perfect); spikelets falling entire at maturity; rachis either continuous, the spikelets falling free, or articulate, the sessile spikelet falling with the rachis-joint and pedicel attached; glumes more or less indurate, firmer than the lemmas, the first always longer than the florets; lemmas membranous or hyaline, the upper (fertile) usually with a geniculate awn from the tip or from between the lobes of a bifid apex; stigmas 2, stamens 3 (rarely 1 or 2). Annuals or perennials with often tall culms and solitary, digitate or paniced spikelike racemes.

### KEY TO THE GENERA

1. Spikelets strongly laterally compressed, solitary at each node.....23. *Dimeria*.
1. Spikelets dorsally compressed or rounded, usually 2-3 at each node (sometimes solitary by the suppression of the pediceled spikelet).
2. Spikelets all alike and fertile, or if unlike the sessile spikelet staminate, the pediceled perfect (sometimes the pediceled spikelets reduced in *Microstegium*).
3. Sessile spikelets perfect, pediceled spikelets usually also perfect.
4. Rachis continuous, not disarticulating, the spikelets falling free (see also *Eulalia irritans*).
5. Spikelets awnless, borne in narrow spikelike panicles.....24. *Imperata*.
5. Spikelets awned (in ours), borne in broad flabellate panicles.....25. *Miscanthus*.
4. Rachis disarticulating, the sessile spikelets falling with the rachis joint and pedicel attached.
6. Racemes numerous, paniculate on an elongate common axis.
7. Fertile lemma awnless, usually much reduced.....26. *Saccharum*.
7. Fertile lemma well developed, mucronate or with a well developed awn.....27. *Erianthus*.

6. Racemes 1 — several, subdigitate or approximate on a shortened common axis.
8. Racemes several, subdigitate or approximate; spikelets 1-awned, or if 2-awned the awns dissimilar.
9. Culms erect or ascending; blades linear; first glume flat or with only a slight groove.....28. *Eulalia*.
9. Culms straggling; blades lanceolate with short petioles; first glume with usually a distinct dorsal groove.....29. *Microstegium*.
8. Racemes solitary; spikelets 2-awned, the awns similar.....30. *Pogonatherum*.
3. Sessile spikelets staminate; pediceled spikelets perfect, long awned.....31. *Sclerandrium*.
2. Spikelets not all fertile, usually differing also in size, shape and awns; sessile spikelet fertile, the pediceled staminate or neuter, often much reduced, sometimes completely wanting, only the pedicel remaining (if spikelets similar then the rachis joints and pedicels thickened).
10. Rachis joints and pedicels thickened, either trigonous, rounded, or flattened (sometimes the pedicel more or less reduced).
11. Racemes reduced to a single joint of three spikelets, each raceme partly enclosed in a swollen bract or spathe, these solitary at the ends of the panicle branches.....33. *Aphuda*.
11. Racemes not as above, several- to many-jointed.
12. Rachis joints and pedicels trigonous, not at all flattened or hollowed out on the side next to the sessile spikelet; fertile lemma usually awned.....32. *Ischaemum*.
12. Rachis joints and pedicels flattened, rounded or hollowed out on the side next to the sessile spikelet; fertile lemma awnless.
13. First glume of sessile spikelet subhemispheric, foveolate, the margins clasping the edges of the fused rachis joint and pedicel.....34. *Hackelochloa*.
13. First glume of sessile spikelet dorsally flattened or slightly convex.
14. Sessile spikelets not deeply sunken in the cavities of the rachis joints; first glume pectinate or with stiff setae on the keels.
15. First glume with a line of balsam glands just inside the keels, the apex bearing two long flattened aristate teeth about as long as the body; pediceled spikelets present.....37. *Elyonurus*.
15. First glume without such glands, obtuse; pediceled spikelets wanting, the pedicels glume-like or stipe-like.....36. *Eremochloa*.
14. Sessile spikelets more or less deeply sunken in the cavities of the rachis joints; first glume smooth on the keel, not pectinate.
16. Pediceled spikelets present.
17. Pediceled and sessile spikelets similar; rachis tenacious, disarticulating very tardily.....35. *Hemarthria*.
17. Pediceled and sessile spikelets dissimilar; rachis fragile, disarticulating readily.....38. *Rottboellia*.
16. Pediceled spikelets wanting, the pedicels firmly fused to the rachis joints.
18. Spikelets all borne on one side of the rachis; first glumes asymmetrical, the apices pointing in alternate directions.....39. *Thaumastochloa*.
18. Spikelets borne alternately on either side of the rachis; first glume symmetrical.....40. *Ophiuros*.
10. Rachis joints and pedicels slender (sometimes somewhat thickened upward); fertile spikelet usually awned.
19. Fertile spikelets disarticulating horizontally, the callus short, blunt.



20. Blades cordate; awn of fertile lemma arising from the base.....43. *Arthraxon*.
20. Blades not cordate; awn of fertile lemma, if present, arising from the tip or from between the teeth of a bifid apex.
21. Racemes in pairs, one sessile, the other peduncled, included in an inflated spathe, these aggregated into a large compound inflorescence; lowest pair of spikelets in one or both racemes homogamous.....45. *Cymbopogon*.
21. Inflorescence not as above.
22. Glumes firmly indurate, smooth and shining.....41. *Sorghum*.
22. Glumes membranous-coriaceous, often more or less prominently nerved.....44. *Andropogon*.
19. Fertile spikelets disarticulating obliquely, the callus pungent-pointed.
23. Racemes without pairs of homogamous spikelets at base.....42. *Chrysopogon*.
23. Racemes with 1 or more pairs of homogamous spikelets at base, these staminate or neuter.
24. Racemes capitate, solitary, long-exserted.....48. *Germainia*.
24. Racemes not as above.
25. Fertile spikelets dorsally flat or grooved; first glume chartaceous.....46. *Hyparrhenia*.
25. Fertile spikelets terete; first glume coriaceous.
26. Homogamous pairs of spikelets 2, approximate and forming a sort of involucre at base of the 1-3-jointed raceme; inflorescence a large spatheate panicle.....47. *Themeda*.
26. Homogamous pairs of spikelets 1 to many at base of the several to many-jointed raceme; inflorescence a solitary spikelike raceme terminating the culms and branches; sterile spikelets obliquely lanceolate, imbricate and obscuring the fertile spikelets.....49. *Heteropogon*.

### 23. *Dimeria* R. Br.

*Dimeria* R. Br., Prodr. Fl. Nov. Holl. 1: 204. 1810.

*Haplachne* Presl, Rel. Haenk. 1: 234. pl. 38. 1830.

*Woodrowia* Stapf, Hook. Ic. 25: pl. 2447. 1896.

Spikelets strongly laterally compressed, short-pedicelled, solitary in two rows on one side of a trigonous or flattened continuous rachis; glumes keeled, often winged, only slightly indurate, the margins usually hyaline; first glume usually narrower and slightly shorter than the second; lemmas hyaline, the sterile shorter, awnless, the fertile rarely awnless, usually awned from the bifid apex, the awn geniculate, the basal segment brown and twisted; stamens 2. Annuals or perennials with usually slender culms and digitate or approximate, sometimes solitary, racemes.

TYPE SPECIES: *Dimeria acinaciformis* R. Br.

#### KEY TO THE SPECIES

1. Spikelets 3.5-5 mm. long.
2. Racemes solitary.....1. *D. monostachya*.
2. Racemes 2 to 5.
3. Both glumes prominently winged on the keel; rachis 1 mm. wide, densely ciliate on the margins.....2. *D. dipteros*.
3. First glume not winged; rachis about 0.8 mm. wide, scabrous or only sparsely ciliate on the margins.....3. *D. ciliata*.

## 1. Spikelets 2-2.5 mm. long.

4. Second glume not winged on the keel; fertile floret awned, the awn geniculate. . . . . 4. *D. ornithopoda*.  
 4. Second glume winged on the keel; fertile floret awnless or with a reduced straight awn. . . . . 5. *D. glabriuscula*.

1. *Dimeria monostachya* sp. nov. PLATE V, Figs. a, b.

Annua 25-45 cm. alta; culmis filiformibus, erectis, glabris; nodis breviter barbatis, circiter 7; vaginis carinatis, pilosis, pilis circiter 1 mm. longis; ligula membranacea, circiter 0.5 mm. longa; laminis planis vel conduplicatis, erectis, 2-3 mm. latis, inferioribus 4-8 cm. longis, ad apicem culmis brevioribus, marginibus plus minusve revolutis, utrinque pilosis, pilis quam eis vaginae paullo longioribus; racemo solitario, 5-7 cm. longo, floribus confertis; rhachi circiter 0.8 mm. lata, complanata, dorso leviter rotundato, marginibus dense ciliatis; pedicellis complanatis, circiter 0.2 mm. longis; spiculis imbricatis, 3.5-4 mm. longis; glumis dense allopilosis, carinis longe ciliatis; gluma prima acuta, quam gluma secunda paullo brevior, carina haud alata; gluma secunda acuminata, quam gluma prima duplo latiore, carina tota longitudine late alata, margine ciliato, ceterum glabra; lemmate sterili quam fertili paullo brevior; lemmate fertili quam spicula circiter quarta parte brevior, arista circiter 8 mm. longa, columna 1-1.5 mm. longa; antheris circiter 0.8 mm. longis.

BRITISH NEW GUINEA: Western Division: Lake Daviumbu, Middle Fly River, Brass 7806 (A, TYPE, US), September, 1936 (gregarious on wetter savannahs).

Closely related to *Dimeria sinensis* Rendle, but differing in having larger spikelets in which the second glume is acuminate rather than obtuse, and in the shorter awn in which the column is 1-1.5 mm. long rather than 3-4 mm. as in *D. sinensis*. The habit suggests *D. pusilla* Thwaites, but that species is smaller and has larger spikelets in which the glumes are aristate.

The above specimen was reported as *Dimeria falcata* Hack. by Chase (17, p. 313).

2. *Dimeria dipteros* sp. nov. PLATE VI.

Annua 30-80 cm. alta; culmis glabris, simplicibus, erectis vel adscendentibus; nodis barbatis, pilis adscendentibus circiter 2 mm. longis; vaginis carinatis, dense pilosis, quam internodiis longioribus; ligula membranacea, ciliolata, circiter 0.6 mm. longa; laminis erectis, planis, 5-12 cm. longis, 3-5 mm. latis (summa valde redacta) dense pilosis; racemis binatis vel ternatis, 5-8 cm. longis; rhachi circiter 1 mm. lata, anguste alata, alis dense rigido-ciliatis, pilis 0.5-1 mm. longis, ceterum glabra; pedicellis complanatis, circiter 0.5 mm. longis, marginibus apicem versus rigido-ciliatis, pilis quam pedicellis paullo longioribus; spiculis plus minusve pubescentibus, anguste obovatis, callo breve barbato; glumis subaequalibus, acutis, carinis late alatis, marginibus ciliatis, pilis apicem versus brevioribus; gluma prima 4-4.5 mm. longa, carina quam corpo glumae plerumque paullo latiore; gluma secunda 4.5-5 mm. longa, 1.5 mm. lata, carina circiter 0.5 mm. lata, apicem versus paullo latiore; lemmate sterili scariosa, ciliata, 2.5-3 mm. longa; lemmate fertili 3.5-4 mm. longa, aristata; arista 8-10 mm. longa, e apicem lemmatis bifida, columna 1.5-2 mm. longa; antheris 1.5 mm. longis.

BRITISH NEW GUINEA: Central Division: Urunu, Vanapa Valley, alt. 1900 m., Brass 4802 (GH, US) (a few plants among sedges in small swampy hollows on



grassland). NETHERLANDS NEW GUINEA: Balim River, alt. 1800 m., *Brass* 11738 (A, US, TYPE), Dec. 1938 (common on sandy, long deforested slopes).

Related to *Dimeria bialata* C. E. C. Fisch. but that species is much smaller and has much shorter racemes, slightly smaller more glabrous spikelets, anthers 1 mm. long, and an awn with the column about 3 mm. long.

Comparison may also be made with *Dimeria chloridiformis* (Gaudich.) K. Schum. & Lauterb., but that species has somewhat longer leaves, culms which are pubescent below the inflorescence, racemes in 4's or 5's, and the common axis pubescent rather than glabrous. The greatest difference, however, is seen in the spikelets, in which the first glume is apiculate and wingless, the second acuminate and with only a very small wing just below the tip. The anthers are 1.8 mm. long.

*Brass* 4802 was reported as *Dimeria chloridiformis* by Hitchcock (35, p. 124).

3. *Dimeria ciliata* Merr., Philip. Jour. Sci. Bot. 9: 262. 1914. Type from the Philippines.

Perennial; culms slender, tufted, more or less pubescent, 50–85 cm. tall; nodes bearded, the hairs stiffly ascending, 1–1.5 mm. long; sheaths slightly shorter than the internodes, more or less pilose, keeled, at least above; ligule about 0.8 mm. long; membranous, often ciliate; blades more or less densely pilose, 8–25 cm. long, 3–5 mm. wide; inflorescence long-exserted, of 3–6 racemes, the common axis about 1 mm. long; racemes 7–13 cm. long, the rachis trigonous, about 0.8 mm. wide, glabrous or slightly ciliate on the margin, sometimes slightly pubescent on the back; pedicels 0.8–1 mm. long, rather stout, ciliate on the outer margins; spikelets 4–4.5 mm. long, the glumes prominently ciliate with long white hairs on the keels; the first glume slightly shorter and narrower than the second, not winged; second glume with a prominent wing on the keel toward the apex, the lower half wingless; sterile lemma about 3 mm. long, ciliate; fertile lemma about 3.5 mm. long, the awn about 10 mm. long; anthers about 1 mm. long.

BRITISH NEW GUINEA: Western Division: Dagwa, Oriomo River, alt. about 40 m., *Brass* 5911 (A, US, NY) (scattered in small, spreading tufts on damp ridge slopes).

Philippines, New Guinea.

Related to *Dimeria chloridiformis* (Gaudich.) K. Schum. & Lauterb., from the Marianas, but differing in the smaller spikelets, less pubescent foliage, and narrower rachises, which are not densely ciliate.

*Brass* 5911 was reported as *Eulalia argentea* Brongn. var. *queenslandica* (Domin) Hitchc. by Hitchcock (35, p. 126). The combination which he makes there is a valid one but does not apply to the New Guinea plants.

3a. *Dimeria ciliata* Merr. var. *heteromorpha* var. nov.

A typo differt culmis vaginisque glabris, laminis glabris vel marginibus plus minusve pilosis basi tuberculatis, ala glumae secundae interdum ad basin imam extendit.

BRITISH NEW GUINEA: Western Division: Lake Daviumbu, Middle Fly River, *Brass* 7807 (A, TYPE, US), Sept. 1936 (gregarious in small patches on wet savannahs), *Brass* 7932 (A, US) (plentiful on moist savannah slopes).

Differs from the species in having glabrous culms and sheaths, the blades glabrous or with the margins more or less tuberculate-pilose, and the wing of the second legume sometimes extending all the way to the base. The varietal epithet refers to the variable nature of the spikelets. Within the same inflorescence, in some spikelets the second glumes are winged only at the apex as in typical *Dimeria ciliata*, in others the wings extend entirely to the base, and there are numerous intergradations.

4. *Dimeria ornithopoda* Trin., Fund. Agrost. 167. fig. 14. 1820; C. T. White, Proc. Roy. Soc. Queensl. 34: 14. 1923. Type from India.

Annual; culms glabrous, slender, tufted, 15–30 cm. tall (rarely taller), the nodes bearded; sheaths mostly shorter than the internodes, keeled, glabrous to papillose-pilose; ligule about 0.5 mm. long; blades erect, as much as 6 cm. long, 2–3 mm. wide, glabrous or papillose-pilose; racemes binate or ternate, 2–5 cm. long, the rachis undulate, trigonous, about 0.3 mm. wide or less, the margins scabrous; pedicels very short; spikelets 2–2.5 mm. long, the callus short-bearded; glumes subequal, acute, scabrous or somewhat pubescent, the keels not winged; fertile lemma slightly shorter than the first glume and bearing a geniculate awn, the column of which is about as long as the spikelet; anthers about 0.5 mm. long.

Widely distributed in the tropics and subtropics of the Old World.

No specimens of this species were seen from New Guinea — the description was drawn up from Philippine and Australian specimens. Included here since it was reported by White, and it seems probable that it occurs in New Guinea.

5. *Dimeria glabriuscula* F. M. Bailey, Syn. Queensl. Fl. Suppl. 3: 83. 1890. Type from Australia.  
*Dimeria glabra* Ridley, Fl. Malay Penin. 5: 192. 1925; Hitchc., Brittonia 2: 125. 1936. Type from Singapore.

Annual; culms glabrous, erect, tufted, very slender, 20–50 cm. tall, the nodes minutely bearded; sheaths keeled, glabrous or slightly ciliate on the margins; ligule about 0.5 mm. long; blades 2–6 cm. long, 2–3 mm. wide, glabrous or slightly pubescent; racemes binate or ternate, 3–6 cm. long, the trigonous rachis about 0.4 mm. wide, undulate, the margins scabrous; pedicels very short; spikelets 2–2.5 mm. long, the callus not bearded; glumes subequal, acute, the first narrow, scabrous, the second about twice as wide as the first, scabrous or rarely slightly puberulent, the keel with a narrow wing extending quite or nearly to the base; fertile lemma slightly shorter than the first glume, awnless or with a short straight awn (rarely a few of the spikelets with a geniculate awn); anthers about 0.5 mm. long.

BRITISH NEW GUINEA: Western Division: Dagwa, Oriomo River, alt. 40 m., *Brass* 5984 (GH, US) (in small patches or colonies on damp grass slopes); Lake Daviumbu, Middle Fly River, *Brass* 7850 (A, US) (rare grass, gregarious on wet savannahs).

Singapore, Netherlands Indies, the Philippines, New Guinea to Australia.

Closely related to *Dimeria ornithopoda* but differing in being more nearly glabrous and in having a more erect habit. Further differences are seen in the spikelets, which are not bearded on the callus, have the second glume winged on the keel, and the fertile lemma awnless or with a reduced straight awn.



24. *Imperata* Cyrillo

*Imperata* Cyrillo, Pl. Rar. Neap. 2: 26. pl. 11. 1792.

Spikelets more or less dorsally compressed, all alike and perfect, usually in pairs (rarely solitary), unequally pediceled, along a slender continuous rachis, surrounded by long silky hairs from the base and lower part of the glumes; glumes about equal, membranous; lemmas hyaline, awnless, shorter than the glumes; styles 2; stamens 1 or 2. Perennials with stout creeping rhizomes and more or less spikelike, conspicuously silky panicles.

TYPE SPECIES: *Imperata arundinacea* Cyrillo = *I. cylindrica* (L.) Beauv. (*Lagurus cylindricus* L.).

## KEY TO THE SPECIES

1. Stamens 2; panicle dense, spikelike.....1. *I. cylindrica*.
1. Stamen 1; panicle somewhat open (rather dense in high altitude form).....  
.....2. *I. exaltata*.
1. *Imperata cylindrica* (L.) Beauv., Ess. Agrost. 165, 177, pl. 5, fig. 1. 1812; Hitchc., Brittonia 2: 125. 1936; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 111. fig. 64. 1940.  
*Lagurus cylindricus* L., Syst. Nat. ed. 10. 2: 878. 1759. No locality given.  
*Imperata arundinacea* Cyrillo, Pl. Rar. Neap. 2: 27. pl. 11. 1792; F. Muell., Vict. Nat. 1: 168. 1844; Hack. in DC., Monogr. Phan. 6: 92. 1889. Type from Italy.
- 1a. *Imperata cylindrica* (L.) Beauv. var. *major* (Nees) C. E. Hubb. in C. E. Hubb. & Vaughan, Grass. Maurit. and Rodriguez 96. 1940.  
*Saccharum Koenigii* Retz., Obs. Bot. 5: 16. 1789. Type from Japan.  
*Imperata Koenigii* (Retz.) Beauv., Ess. Agrost. 165. 1812.  
*Saccharum confertum* Presl, Rel. Haenk. 1: 346. 1830. Type from the Philippines.  
*Imperata Koenigii* (Retz.) Beauv. var. *major* Nees, Fl. Afr. Austr. 90. 1841. Type from Africa.  
*Imperata arundinacea* Cyrillo var. *Koenigii* (Retz.) Benth., Fl. Hongk. 419. 1861; Hack., Bot. Jahrb. 6: 238. 1855, in DC., Monogr. Phan. 6: 94. 1889.  
*Imperata cylindrica* (L.) Beauv. subvar. *Koenigii* (Retz.) Durand & Schinz, Consp. Fl. Afr. 5: 694. 1894.  
*Imperata cylindrica* (L.) Beauv. var. *Koenigii* (Retz.) Pilger in Perk., Fragm. Fl. Philip. 137. 1904; Hack., Denkschr. Akad. Wiss. Math.-Naturw. (Wien) 89: 492. 1913.  
*Imperata conferta* (Presl) Ohwi, Bot. Mag. (Tokyo) 55: 549. 1941.

Culms erect, simple, slender to moderately stout, 40–120 cm. tall, mostly 1- to 3-noded, the nodes bearded; sheaths overlapping, keeled, glabrous or slightly pubescent; ligule truncate, 0.5–1 mm. long; blades linear-lanceolate, broadest at the middle and tapering to either end, flat, very variable in length, 10–50 cm. or more long, 5–15 mm. wide, glabrous or hairy at the base, scabrous on the margins; panicle usually densely cylindric, sometimes slightly branching at the base, 5–22 cm. long; spikelets 3–4 mm. long, the hairs about 10 mm. long; glumes subequal, membranous, 3–7-nerved; anthers 2, borne on long slender filaments.

BRITISH NEW GUINEA: Western Division: Gaima, Lower Fly River, Brass 8296 (A, US) (covering old clearings in both savannah and rain-forest). NORTHEAST NEW GUINEA: Morobe District: Near Kajabit Mission, alt. about 200 m., Clemens 10668b (US); in the Ramu Valley near the headwaters of the Markham River, Rogers 3001 (A); four miles south of Langemak Bay, Sawyer 81 (A); near Yabim, H. Zahn in 1903 (US).

East Africa, Indo-Malayan region, New Guinea to Australia. Also Japan.

*Imperata cylindrica* is an extremely variable and wide-ranging species, and hence it has a large number of synonyms. C. E. Hubbard (Imp. Agric. Bur. Joint Publ. 7:5-13. 1 map. 1944) recognizes five varieties, one of which occurs in South America and the rest in the Old World. Variety *major*, to which our plants appear to belong, has a greater range than the others and probably a greater variability. According to Hubbard, each of the varieties has a rather definite geographic distribution.

2. *Imperata exaltata* Brongn. in Duperry, Bot. Voy. Coquille 2(2): 101. 1831; Hack. in DC., Monogr. Phan. 6: 98. 1889; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 165. 1901; Hitchc., Brittonia 2: 125. 1936. Type from Waigiou Island.

*Saccharum macilentum* Chauvin ex Steud., Syn. Pl. Glum. 1: 406. 1854; F. Muell., Pap. Pl. 1: 47. 1876. Type from Waigiou Island.

Culms 60-150 cm. tall (rarely only 25 cm. in subsp. *Merrillii*), slender in proportion to their height, 3-4-noded, the nodes not bearded; sheaths overlapping, more or less keeled; ligule truncate, shortly ciliate, 0.5-1.5 mm. long; blades lanceolate-linear or rarely linear, flat or sometimes involute, 25-80 cm. long, 6-20 mm. wide, the base attenuate and distinctly canaliculate at the junction of the sheaths, glabrous or pilose only at the base, the margins scabrous; panicle as much as 40 cm. long, 3-7 cm. wide, with numerous short rather lax branches especially toward the base; spikelets 2.5-3 mm. long, the hairs 2 to 3 times as long; glumes subequal, 3-nerved; stamen 1, 2-2.5 mm. long.

BRITISH NEW GUINEA: Islands near the southeast end, *Armit 55* (US); Central Division: Urunu, Vanapa Valley, *Brass 4813* (A, US) (common on paths through old garden lands); Kanosia, *Carr 11244* (NY) (on open savannah land); Western Division: Junction of the Black and Palmer Rivers, *Brass 6945* (A, US) (forming dense pure stands on a gravel island in the Palmer River); Northern Division: About 9 miles northwest of Oro Bay, *Reeder 813* (A, US) (bank of creek in partial shade). NORTHEAST NEW GUINEA: Morobe District: Huon Gulf, *Herre 231* (NY). NETHERLANDS NEW GUINEA: Nassau region, Explorat Biv., alt. about 700 m., *Docters van Leeuwen 10500* (GH). NEW BRITAIN: *Parkinson 65* (US).

Southeastern Asia to New Guinea.

- 2a. *Imperata exaltata* Brongn. subsp. *Merrillii* Hack., Philip. Jour. Sci. 1: Suppl. 264. 1906. Type from the Philippines.

Differs from the typical form in having narrower blades and a shorter, denser panicle. The spikelets seem to be identical and have only one stamen as in the species.

BRITISH NEW GUINEA: Central Division: Wharton Range, Murray Pass, alt. 2840 m., *Brass 4721* (A, US) (common on hillsides and in open country). NETHERLANDS NEW GUINEA: Northern slopes of Mount Wilhelm, Wemena River, alt. 3200 m., *Brass & Meyer-Drees 10235* (A, US) (covering beaches of gravel and sand); 9 km. northeast of Lake Habbema, alt. 2600 m., *Brass 10902* (A, US) (on old landslide in forest); Bele River, 18 km. northeast of Lake Habbema, alt. 2200 m., *Brass 11491* (A, US) (dominant grass on old garden lands).

Philippines and New Guinea.

The cited specimens look superficially like *Imperata cylindrica* and were cited under this name by Chase (24, p. 88). They differ in having slightly smaller spikelets with only one stamen. This is apparently a



high altitude form of *I. exaltata* and perhaps not worthy of subspecific status.

## 25. *Miscanthus* Anderss.

*Miscanthus* Anderss., Oefv. Svensk. Vet. Akad. Foerhandl. Stockh. 1855: 165. 1856.

*Eulalia* Trin., Mém. Acad. St. Pétersb. VI. 2: 332. 1832 (non Kunth, 1829).

*Xiphagrostis* Coville, Contr. U. S. Nat. Herb. 9: 399. pl. 69. 1905.

Spikelets all alike and perfect, in pairs, unequally pediceled on a continuous rachis, the callus villous; glumes subequal, chartaceo-membranous; lemma hyaline, the fertile bifid and awned or rarely awnless, the awn twisted, straight or slightly geniculate. Tall perennials with long flat or convolute blades and large open terminal panicles of several to many racemes.

TYPE SPECIES: *Miscanthus japonicus* Anderss. = *M. floridulus* (Labill.) Warb. (*Saccharum floridulum* Labill.).

1. *Miscanthus floridulus* (Labill.) Warb. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 166. 1901; C. T. White, Proc. Roy. Soc. Queensl. 34: 15. 1923.

*Saccharum floridulum* Labill., Sert. Austro. Caled. 13. pl. 18. 1824. Type presumably from New Caledonia.

*Miscanthus japonicus* Anderss., Oefv. Svensk. Vet. Akad. Foerhandl. Stockh. 1855: 166. 1856; Warb., Bot. Jahrb. 16: 13. 1892; Hitchc., Proc. Linn. Soc. N. S.

Wales 54: 145. 1929 (non *Saccharum japonicum* Thunb. 1794). Type from Japan.

Culms in large clumps, erect, robust, 1.5–4 meters tall; sheaths overlapping, glabrous, not keeled; ligule membranous, about 1 mm. long, often ciliate; blades 25–80 cm. long, 10–30 mm. wide, rather firm, the margins serrulate-scabrous; panicle broad, flabellate, 15–40 cm. long, the central axis about two-thirds as long; lower branches 15–20 cm. long, the rachis glabrous or sometimes pilose; spikelets 3–5 mm. long, the soft spreading callus hairs about as long; awn about 3–8 mm. long.

BRITISH NEW GUINEA: Gulf Division: Ihu, Vailala River, *Brass* 920 (GH, US) (in large thickets on the river banks); Central Division: Wharton Range, Murray Pass, alt. 2800 m., *Brass* 4191 (A, US) (large tussock grass scattered on open slopes), *Brass* 4528 (GH, US) (rare; sporadic on open grasslands), *Brass* 4723 (US) (rare; in large clumps on open country); Urunu, Vanapa Valley, alt. 1900 m., *Brass* 4778 (GH, US) (covers large areas of old garden land on deforested valley slopes. NORTHEAST NEW GUINEA: Morobe District: Sattelberg, Ogeramang, alt. about 1800 m., *Clemens* 4454 (A); Sarawaket, alt. about 2500 m., *Clemens* 6145 (A). NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habema, alt. 2200 m., *Brass* 11584 (forming occasional thickets in open second growths); Balim River, alt. 1600 m., *Brass* 11809 (A, US) (a few clumps on river bank).

Eastern Asia to Polynesia.

## 26. *Saccharum* L.

*Saccharum* L., Sp. Pl. 54. 1753; Gen. Pl. ed. 5. 28. 1754.

Spikelets all alike and perfect, awnless, in pairs, one sessile, the other pediceled on an articulate fragile rachis, this disarticulating below the spikelets; glumes equal, somewhat indurate, often more firm below, the first usually 2–4-nerved (rarely with a midnerve), the second 1–5-nerved; sterile lemma hyaline, about as long as the glumes; fertile lemma much reduced or wanting. Tall perennials with large silky terminal panicles.

TYPE SPECIES: *Saccharum officinarum* L.

1. *Saccharum spontaneum* L., Mant. 2: 183. 1771; F. Muell., Pap. Pl. 1: 46. 1879; Hack., Bot. Jahrb. 6: 238. 1885, in DC., Monogr. Phan. 6: 113. 1889. Type from India.  
*Imperata spontanea* (L.) Beauv. ex Roem. & Schult., Syst. 2: 289. 1817.  
*Saccharum robustum* Brandes & Jeswiet ex Grassl, Jour. Arnold Arb. 27: 234. 1946. Type from New Guinea.

Culms in dense tufts or clumps, 2–10 meters tall, slender and more or less woody at base to robust and pithy, erect or somewhat decumbent at base; sheaths longer than the internodes, sparsely to densely pubescent, the hairs usually more dense near the margins; ligule membranous, short ciliate, 1.5–4 mm. long; blades long-linear, 1–5 (rarely 7) cm. wide, the margins serrulate-scabrous; panicle 20–90 cm. long, the fragile branches suberect or spreading; rachis long-pilose or only scabrous; spikelets 3–5.5 mm. long, the glumes usually more or less firmly indurate and often reddish on the lower half, the upper margins ciliate; sterile lemma well developed, about as long as the glumes; fertile lemma very much reduced or completely wanting.

BRITISH NEW GUINEA: Central Division: Rona, Laloki River, alt. 450 m., *Brass* 3628 (A, US) (on roadsides in savannahs, not common); near Port Moresby, Rauna Falls, *Jeswiet* in 1928 (US); Kanosia, *Carr* 11129 (NY) (open savannah land); banks of the Laloki River, about 27 km. from Port Moresby, *Jeswiet* in June, 1928 (US) (type of *S. robustum*); Northern Division: Near Dobodura, on banks of Samboga River, *Reeder* 828 (A, US) (on gravelly soil; culms 3–4 meters tall); Western Division: Palmer River, *Brass* 6957 (A) (stands 3–4 meters high on gravel banks of the river). NORTHEAST NEW GUINEA: Morobe District: *Clemens* 6558 (A); Wareo, alt. 625 m., *Clemens* 1410 (A); Ongerman [sic], on the Sepik River, *Herre* 284 (NY) (on river banks; plants 10–20 feet high; covers tens of thousands of acres extending along the Sepik River for over 500 m. from the sea and beyond for an unknown distance). NETHERLANDS NEW GUINEA: Near Hollandia, *Brass* 8920 (A) (forming small thickets 2–3 meters high along the river); 18 km. northeast of Lake Habbema, Bele River, alt. 2200 m., *Brass* 11374 (A, US) (very abundant in tall thickets on abandoned garden land, 2.5–3 meters high); Balim River, alt. 1600 m., *Brass* 11778 (A, US) (abundant on alluvial soil of river banks; gregarious in clumps about 2 meters high); 4 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., *Brass* 13264 (A, US) (colonizing sand and gravel beaches in river; thickets up to 8 meters high); Bernhard Camp, Idenburg River, alt. 50 m., *Brass* 13791 (A, US) (in dense pure stands 7–8 meters high on recent silt deposits of the river banks).

Widely distributed from the Indo-Malayan region to New Guinea and adjacent islands.

*Saccharum robustum* Brandes & Jeswiet ex Grassl is here treated as a synonym, since the distinctions given by Grassl as separating it from *S. spontaneum* do not seem to hold. In the discussion following the original description one reads that *S. robustum* is "distinguished readily" by the reduced third glume [fertile lemma], the sparser and shorter hairs on the rachis and callus, the smaller spikelets, and the much larger size of the plants themselves. Examination of available specimens shows that these distinctions have little basis in fact. The fertile lemma is reduced in all the cited specimens, although the degree of reduction varies in different plants and even in different spikelets in the same panicle. Grassl implies that the large, robust plants (*S. robustum*) have small spikelets, while in the smaller plants (*S. spontaneum*) the spikelets are larger. *Carr* 11129



is a small plant with a slender, woody culm, yet the spikelets are only about 3 mm. long. *Brass 6957* has rather robust culms, broad blades, and small spikelets, yet on the label the height of the plant is given as "3-4 m." *Brass 11374* has the broad blades and robust culms of *S. robustum*, yet the spikelets are 5-5.5 mm. long, and the height of the plants is given as only 2.5-3 meters. There seems also to be little correlation between the size of the spikelets and the length of the hairs on the rachis and callus. In view of the difficulty, if not impossibility, of separating coherent groups from the New Guinea material, it seems advisable to consider it as one polymorphic species pending further detailed collecting and field study.

2. *Saccharum officinarum* L., Sp. Pl. 54. 1753; Hack. Bot. Jahrb. 13: 263. 1890; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 114-116. fig. 66. 1940. Type from India.  
*Saccharum sinense* Roxb., Fl. Ind. 1: 244. 1820; Ohwi, Bot. Mag. (Tokyo) 56: 9. 1942. Described from specimens in Botanical Garden introduced from China.

This is the cultivated sugar cane. It is widely distributed and cultivated by natives throughout the Island and is spontaneous in old garden lands. The culms are 2-6 meters tall and 2-4 cm. in diameter. The lower internodes are often very short and stout. No herbarium specimens of this species from New Guinea have been seen. Living plants were observed in native gardens on numerous occasions while the writer was there in 1943-44. Unfortunately no specimens were collected.

3. *Saccharum edule* Hassk., Flora 25: Beibl. 3. 1842. Type from Java.  
*Saccharum spontaneum* L. var. *edulis* (Hassk.) K. Schum. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 166. 1901.

In this species the inflorescence fails to develop normally and remains permanently enclosed within the sheaths of the upper leaves. This abortive inflorescence is roasted and eaten as a vegetable by the natives. Since it produces no flowers, the plant can be propagated only by vegetative means. Grassl (Jour. Arnold Arb. 27: 240-242. 1946) discusses the relationship of this horticultural species with other species of *Saccharum*. He also (op. cit. pl. 2, fig. 1, 2) figures the abortive inflorescence. The species is apparently cultivated throughout the island. As seen growing, it resembles *S. officinarum*, but the culms are dry and do not contain sweet juice. Hackel (24, p. 263) doubtfully reports *S. edule* from New Guinea.

No specimens of this species were available to the writer, but living plants were observed in a native garden in British New Guinea in 1943. As in the case of the former species, no specimens were collected.

## 27. *Erianthus* Michx.

*Erianthus* Michx., Fl. Bor. Amer. 1: 54. 1803.

Spikelets all alike and perfect, awned or awn-pointed, in pairs along a slender rachis, one sessile, the other pediceled, the rachis disarticulating below the spikelets, the rachis joint and pedicel falling attached to the sessile spikelet; glumes coriaceous, equal, usually clothed with long spread-

ing silky hairs; sterile lemma hyaline, empty; fertile lemma hyaline, the midnerve extending into a prominent awn or the lemma at least awn-pointed. Perennials with dense terminal silky panicles.

TYPE SPECIES: *Erianthus saccharoides* Michx. = *E. giganteus* (Walt.) Muhl. (*Anthoxanthum giganteum* Walt.).

#### KEY TO THE SPECIES

1. Fertile lemma mucronate or the awn only about 1 mm. long; panicle 25–60 cm. long.....1. *E. arundinaceus*.
1. Fertile lemma with an awn as long as the spikelet or longer; panicles about 15 cm. long.....2. *E. fastigiatus*.
1. *Erianthus arundinaceus* (Retz.) Jesw., Arch. Suikerind Nederland Indië Meded. 33: 399. 1925; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 118. 1940.  
*Saccharum arundinaceum* Retz., Obs. Bot. 4: 14. 1786; Hack. in DC., Monogr. Phan. 6: 117. 1889; Ridley, Trans. Linn. Soc. II. (Bot.) 9: 249. 1916. Type from India.

Culms robust, 2–5 (sometimes to 7) meters tall, 1–2 cm. in diameter; sheaths longer than the internodes, glabrous, often pruinose; ligule membranous, ciliate, 1–2 mm. long; blades flat, linear, 30–150 cm. long, 10–70 mm. wide, glabrous, smooth, the margins serrulate-scabrous; panicle large, plume-like, 25–60 cm. long, the branches ascending or somewhat spreading; spikelets 3.5–4 mm. long, the callus short-bearded; glumes acuminate, the dorsal surface clothed with long spreading hairs or the second glume sometimes glabrous or nearly so; sterile lemma about equaling the glumes; fertile lemma slightly shorter, the midnerve extending into a short mucro or an awn as much as 1 mm. long; fertile palea about half as long as the lemma.

BRITISH NEW GUINEA: Western Division: Fly River, about 30 miles below Everill Junction, *Brass* 6582 (A, US) (in pure stands, 3–5 meters high; occupies many miles of the swampy banks of the middle river); Strickland River, *W. Bauerlen* 60 (US).

Indo-Malayan Region to New Guinea.

2. *Erianthus fastigiatus* (Nees ex Steud.) Hack. in DC., Monogr. Phan. 6: 150. 1889. *Saccharum fastigiatum* Nees ex Steud., Syn. Pl. Glum. 1: 409. 1855. Type from India.  
*Erianthus sesquimetricus* Ohwi, Bot. Mag. (Tokyo) 56: 9. 1942. Type from Netherlands New Guinea.

Culms subrobust, 150 cm. or more tall, appressed-pilose at the summit, otherwise glabrous; sheaths 20–30 cm. long, appressed-pilose on the margins near the summit, otherwise glabrous; ligule truncate, minutely ciliate, about 0.7 mm. long; blades elongate, 30–80 cm. long, 5–8 mm. wide, rigid, glabrous except for a few hairs at the base; panicle short-exserted, erect, about 15 cm. long, 3–4 cm. wide, the axis clothed with long white hairs; racemes solitary, the lower about 4 cm. long, the rachis pilose with white spreading hairs, the joints about one-third shorter than the spikelets; pedicels rather slender and pilose like the rachis; spikelets lanceolate, about 4 mm. long; glumes acute, reddish brown except for the pale apex; first glume minutely bimucronate, flattened, the lower half near the margins bearing long white hairs; second glume 1-nerved, the lower part of the keel short-pilose; sterile lemma nerveless, slightly shorter than



the glumes, somewhat brownish below, the margins and scarious apex ciliate; fertile lemma about 1.5 mm. long, bidentate and bearing a brownish awn about 7-8 mm. long; palea about half as long as the lemma.

NETHERLANDS NEW GUINEA: Momi, 60 miles south of Manokwari, *Kanehira & Hatusima* 13291 (type of *E. sesquimetricalis* Ohwi) (fragment at A) (in waste plantation 10 m. above the sea).

The type of *Erianthus fastigiatus* has not been seen, but from the brief description in Steudel, and Hackel's detailed diagnosis, *E. sesquimetricalis* seems referable to this species. A fragmentary specimen in the U. S. National Herbarium, from India, which seems to represent this species, has spikelets which are almost identical with those of the New Guinea plant except that the hairs on the first glume are slightly shorter.

## 28. *Eulalia* Kunth

*Eulalia* Kunth, Rev. Gram. 1: 160. 1829.

*Pollinia* Trin. sect. *Eulalia* (Kunth) Benth. & Hook., Gen. Pl. 3: 1127. 1883.

*Pollinia* Trin. subgen. *Eulalia* (Kunth) Hack. in DC., Monogr. Phan. 6: 152. 1889.

Spikelets paired, all alike and perfect, one pediceled and falling free from the pedicel, the other sessile and falling with the rachis joint and the pedicel of the upper spikelet (rarely both pediceled and disarticulating obliquely, forming a sharp-pointed callus, the pedicels remaining attached to the tardily disarticulating rachis joints); glumes subequal, the first dorsally flattened or rounded, sometimes slightly grooved, the second more or less keeled on the back, 1-3-nerved, sometimes awned; sterile lemma hyaline, as long as the glumes, reduced, or sometimes wanting; fertile lemma minute, usually reduced to the delicate base of a stout twisted and geniculate awn. Perennials or rarely annuals with usually erect culms, linear blades, and digitate or approximate racemes.

TYPE SPECIES: *Eulalia aurea* (Bory) Kunth (*Andropogon aureus* Bory).

### KEY TO THE SPECIES

1. One spikelet pediceled, the other sessile; second glume awnless; rachis readily disarticulating at maturity, the joints falling attached to the sessile spikelet.
  2. Inflorescence golden brown; hairs on the spikelets of the same color, 5-10 mm. long.....2. *E. leptostachys*.
  2. Inflorescence grayish brown; hairs on the spikelets silvery, about 2 mm. long or less.....1. *E. trispicata*.
1. Both spikelets pediceled; second glume with a slender awn 5 mm. or more long; rachis tardily disarticulating, the spikelets falling free from the pedicels.
  3. Spikelets reddish brown, about 0.4 mm. wide; fertile lemma with a twice geniculate awn 3-5 cm. long.....3. *E. irritans*.
  3. Spikelets brownish tan, about 0.7 mm. wide; fertile lemma awnless.....3a. *E. irritans* var. *egregia*.
1. *Eulalia trispicata* (Schult.) Henr., Blumea 3: 453. 1940; Ohwi, Bot. Mag. (Tokyo) 56: 10. 1942.  
*Andropogon tristachyos* Roxb., Fl. Ind. 1: 261. 1820 (non *A. tristachyus* H.B.K. 1816). Type from India.  
*Andropogon trispicatus* Schult., Mantissa 2: 452. 1824. Based on *A. tristachyos* Roxb.  
*Eulalia argentea* Brongn. in Duperry, Bot. Voy. Coquille 2: 92. 1830; Hitchc., Brittonia 2: 125. 1936. Type from the Moluccas.

*Pollinia argentea* (Brongn.) Trin., Mém. Acad. St. Pétersb. VI. Sci. Nat. 2(1): 90, 1836; Hack. in DC., Monogr. Phan. 6: 162. 1889; K. Schum. & Holtr., Fl. Kais. Wilhelmsland 22. 1889.

*Eulalia tristachya* (Roxb.) Kuntze, Rev. Gen. 775. 1891; A. Camus, Ann. Soc. Linn. Lyon 68: 203. 1922.

? *Pollinia leptantha* Stapf, Kew Bull. 1909: 266. 1909. Type from Netherlands New Guinea.

Perennial (or sometimes annual?); culms erect, caespitose, 60–100 (rarely to 200) cm. tall, glabrous or slightly pubescent below the inflorescence; sheaths usually glabrous but sometimes pubescent, always more or less pubescent on the collar; ligule about 0.5 mm. long, ciliolate, usually with some longer hairs back of it; blades elongate, 3–5 mm. wide, flat, glabrous beneath, somewhat pilose above, especially near the base; racemes 3–20, digitate or approximate, 5–20 cm. long, the rachis clothed with soft white hairs, the joints about one-fourth shorter than the spikelet; pedicels slightly shorter than the rachis joint and bearing similar hairs; spikelets 2.5–3.5 (rarely to 4.5) mm. long; glumes equal, reddish brown, the first dorsally flattened, 2-nerved, the apex rounded; second glume 3-nerved, somewhat keeled; both glumes clothed with spreading white hairs, especially toward the margins, the hairs often 1 mm. long or more; sterile lemma about equaling the glumes, ciliate; fertile lemma 1.5–2 mm. long, bifid, the teeth often 1 mm. long, awned from between the teeth, the awn twisted and geniculate, 5–10 mm. long.

BRITISH NEW GUINEA: Western Division: Wuroi, Oriomo River, alt. 10–30 m., *Brass* 5710 (A, US) (common on poorly drained grey soil of savannah ridges); Dagwa, Oriomo River, alt. 40 m., *Brass* 5926 (A, US) (the principal grass on damp soil on open ridges); Lake Daviumbu, Middle Fly River, *Brass* 7809 (A, US) (occasional in large tufts on savannahs), *Brass* 7950 (A, US) (occasional on wet savannah plains); Gaima, Lower Fly River, *Brass* 8279 (A, US) (occasional clumps on savannahs); Tarara, Wassi Kussa River, *Brass* 8566 (A, US) (occasional tufts in savannah-forests), *Brass* 8697 (A, US) (in native villages and gardens); Central Division: Sogeri, near Port Moresby, *L. S. Smith N. G.* 98 (A) (in open forest); Northern Division: About 3½ miles south of Dobodura, *Reeder* 821 (A, US) (in open grassland).

India to Australia, New Guinea, and Polynesia.

No type material of *Pollinia leptantha* was available, but from the description and study of numerous specimens of *Eulalia trispicata* from India to New Guinea, it does not appear to be distinct from that species.

2. *Eulalia leptostachys* (Pilger) Henr., *Blumea* 3: 453. 1940; Chase, *Jour. Arnold Arb.* 24: 88. 1943.

*Pollinia leptostachys* Pilger, *Bot. Jahrb.* 52: 170. 1914. Type from New Guinea.

*Pollinia Cumingii* sensu K. Schum. & Lauterb., *Fl. Deutsch. Schutzgeb. Südsee* 166. 1901. (Specimen cited is type of *P. leptostachys*.)

Perennial with scaly rhizomes; culms 40–70 cm. tall, erect or ascending, the base sometimes geniculate, appressed-white-pubescent below the inflorescence, otherwise glabrous; sheaths subglabrous to more or less pubescent, always more or less pilose at the throat; ligule about 0.5 mm. long, ciliolate; blades linear-lanceolate, 6–15 (rarely 20) cm. long and as much as 10 mm. wide, glabrous to more or less short-pubescent, the margins scabrous, the base abruptly narrowed into a very short petiole at the junction with the sheaths; panicle contracted, the branches, pedicels, and spikelets covered with gold-brown hairs; axis 2–4 cm. long, bearing



4–10 densely flowered racemes, about 8–10 cm. long; spikelets 3–4 mm. long, bearing spreading brown hairs about twice their length; first glume somewhat flattened and 2-keeled toward the apex, truncate, erose, and stiffly short-ciliate, usually 2–4-nerved, sometimes also with a midnerve; second glume 1–3-nerved, obscurely keeled, the apex truncate-obtuse, ciliate; sterile lemma usually wanting; fertile lemma minute, bifid, the slender lobes ciliate; awn 1–2 cm. long, the base weakly twisted and geniculate, the bend less than 1 mm. above the apex of the spikelet.

BRITISH NEW GUINEA: North Eastern Division: Mount Obree, alt. about 2000 m., *W. S. Sawyer* 76 (US). NORTHEAST NEW GUINEA: Morobe District: Ogeramnang, alt. about 1700 m., *Clemens* 4725 (A); Kajabit Mission, alt. about 600 m., *Clemens* 10867 (US) (open place at foot of mountain). NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. 2800 m., *Brass* 10901 (A, US) (a few tufts on a dry open landslip in forest); Bele River, 18 km. northeast of Lake Habbema, alt. 2200 m., *Brass* 11363 (A, US) (covering light gravelly [formerly forested] banks of river); Balim River, alt. 1600 m., *Brass* 11825 (A, US) (locally abundant on long deforested slopes).

Endemic.

*Eulalia leptostachys* is related to both *E. Cumingii* (Nees) A. Camus and *E. fulva* (R. Br.) Kuntze, but it differs from both in having the panicle composed of longer, more numerous racemes, and spikelets with an awn which is only weakly twisted and geniculate, the bend occurring just above the tips of the glumes. *Eulalia fulva* has thick woolly culm bases and very thick racemes. *Eulalia Cumingii* has slender, creeping stolons, and the racemes are short and very slender. Both these species have been reported from New Guinea, but I have seen no specimens. They may represent misidentifications for *E. leptostachys*.

3. *Eulalia irritans* (R. Br.) Kuntze, Rev. Gen. 2: 775. 1891; Hitchc., Brittonia 2: 126. 1936.

*Saccharum irritans* R. Br., Prodr. Fl. Nov. Holl. 1: 203. 1810. Type from Australia.

*Erianthus irritans* (R. Br.) Kunth, Rev. Gram. 1: 160. 1829.

*Pollinia irritans* (R. Br.) Benth., Fl. Austral. 7: 525. 1879; Hack. in DC., Monogr. Phan. 6: 155. 1889.

*Pseudopogonatherum irritans* (R. Br.) A. Camus, Ann. Soc. Linn. Lyon 68: 205. 1921.

Annual; culms erect, 6–8-noded, glabrous, 60–100 cm. tall; sheaths glabrous, usually shorter than the internodes; ligule about 0.5 mm. long, minutely ciliate; blades involute, attenuate, as much as 50 cm. long, glabrous below, glaucous and often more or less pubescent above, especially toward the base; panicle 10–15 cm. long, the common axis about 3 cm. long; racemes numerous, erect or ascending, the rachis very tardily disarticulating, about 0.4 mm. wide, the margins stiff-long-ciliate, the hairs longest toward the ends of the joints; spikelets reddish brown, more or less white-pilose, 2.5–3 mm. long, about 0.4 mm. wide (including the callus 3.5–4 mm. long), both alike and pediceled, the longer pedicel 2–2.5 mm., the shorter about 1 mm. long, the pedicels bearing hairs similar to those of the rachis; both spikelets disarticulating obliquely from the pedicels and forming a sharp callus bearing a tuft of stiff white hairs about half as long as the spikelet; glumes subequal, the first 2-nerved, rounded or flattened on the back, the apex minutely bidentate; second

glume 1-3-nerved, slightly keeled on the back, midnerve extending into a slender flexuous awn 5-7 mm. long with a short offset double bend at the base; sterile lemma wanting; fertile lemma narrow, hyaline, bearing a stout twice-geniculate awn, 3-5 cm. long, the lower half brown, twisted, and bearing white hairs 1.5-2 mm. long, the upper half pale and slender; anthers about 1 mm. long.

BRITISH NEW GUINEA: Western Division: Wuroi, Oriomo River, *Brass* 5733 (A, US) (scattered on low grey soil of savannah ridges); Mabaduan, *Brass* 6524 (A, US) (rare grass in savannah forests); Lake Daviumbu, Middle Fly River, *Brass* 7645 (A, US) (not common in savannahs in this locality); Gaima, Lower Fly River, *Brass* 8251 (A, US) (open savannah forests, not common); Central Division: Port Moresby to Kalo, *MacGregor* 53 (US); South Eastern Division: *Chalmers* 71 (US).

Australia and New Guinea to the Philippines.

3a. *Eulalia irritans* (R. Br.) Kuntze var. *egregia* var. nov. PLATE VII, *Figs. d, e*.

A typo lemmate fertili mutica, spiculis latioribus et paullo longioribus, arista glumae secundae longioribus et paullo crassioribus, pedicellis paullo longioribus differt.

BRITISH NEW GUINEA: Western Division: Wai Kussa River, *MacGregor* 8 (US, TYPE), 1890.

The most striking character of this variety is the absence of the awn on the fertile lemma (one spikelet at the base of one of the racemes had an awn 30 mm. long, twice geniculate, and similar in other respects to those of the species; all other spikelets were without such awns). Further differences are seen in the spikelets, which are of a lighter brown color, noticeably broader and slightly longer, the awn of the second glume being somewhat longer and not so slender; the anthers are about 1.5 mm. long as compared with 1 mm. for *E. irritans*, and the pedicels are 1.5-2 mm. and 3 mm. long rather than 1 mm. and 2-2.5 mm. as in the species. Unfortunately only one specimen was available for study. With additional collections this form may prove to be a distinct species.

## 29. *Microstegium* Nees

*Microstegium* Nees in Lindl., Nat. Syst. 447. 1836.

*Pollinia* Trin., Mém. Acad. St. Pétersb. VI. 2: 304. 1832 (non Spreng. 1815).

*Leptatherum* Nees, Proc. Linn. Soc. 1: 92. 1841.

Spikelets in pairs, one sessile or subsessile, the other pediceled, both alike and perfect or the upper sometimes reduced, falling free from the pedicel, the lower spikelet falling with the joint of the rachis and the pedicel of the upper spikelet; glumes chartaceous or membranous, the first usually distinctly dorsally grooved, the second laterally compressed, cymbiform; sterile lemma wanting or rarely well developed, sometimes bearing a staminate flower; fertile lemma small, often reduced to a narrow base of a straight or twisted awn. Mostly annuals with straggling culms, lanceolate blades usually narrowed into short petioles, and few to many digitate or approximate racemes.

TYPE SPECIES: *Microstegium Willdenowianum* Nees = *M. vimineum* (Trin.) A. Camus (*Andropogon vimineus* Trin.).



## KEY TO THE SPECIES

1. Rachis joints ciliate, shorter than the sessile spikelet; sterile lemma wanting or very much reduced.
  2. Blades 15–25 mm. wide; racemes 15–40.....1. *M. spectabile*.
  2. Blades mostly 4–12 mm. wide; racemes 2–10.....2. *M. ciliatum*.
1. Rachis joints glabrous, very slender, equaling or exceeding the sessile spikelet; sterile lemma about as long as the glumes.....3. *M. nudum*.
1. *Microstegium spectabile* (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 200. 1921; Hosakawa, Jour. Soc. Trop. Agr. 7: 310. 1935.
- Pollinia spectabilis* Trin., Mém. Acad. St. Pétersb. VI. 2: 305. 1832; Hack. in DC., Monogr. Phan. 6: 174. 1889, Bot. Jahrb. 13: 260. 1890. Type from the Carolines.
- Pollinia pleiostachya* Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 168. 1901. Type from Northeast New Guinea.
- Microstegium pleiostachyum* (Lauterb. & K. Schum.) A. Camus, Ann. Soc. Linn. Lyon 68: 200. 1921.

Culms prostrate, branching, more than a meter long, firm, glabrous throughout or the lower nodes sometimes minutely bearded; sheaths striate, keeled above, glabrous or more or less papillose-pilose near the margins, the upper margins extending into slight auricles 1.5–2 mm. long connected by the membranous ligule; blades lanceolate, 10–18 cm. long, 15–25 mm. wide, the midrib whitish and prominent below, glabrous, the margins scabrous; apex acuminate, the base narrowed into a short petiole about 2 mm. long; panicle 8–14 cm. long, composed of 15–40 approximate racemes; rachis slender, bristly-ciliate on the margins, the joints slightly shorter than the subsessile lower spikelets, the pedicel about three-fourths as long as the rachis joint, also bristly-ciliate; lower spikelet 3–3.5 mm. long, the callus short-bearded; first glume obscurely 4-nerved (sometimes with a midnerve), the margins scabrous-pectinate toward the acuminate entire or minutely bifid apex; second glume 1–3-nerved, acuminate or aristulate, the prominent keel scabrous-pectinate; sterile lemma wanting; fertile lemma minute, bearing a slender capillary weakly twisted awn 1–3 times as long as the spikelet; anthers 1.5–2 mm. long; the upper spikelet similar but slightly smaller, the nerves of the glumes often more prominent.

BRITISH NEW GUINEA: Central Division: Koitaki, Carr 12236 (US) (in forest). NORTHEAST NEW GUINEA: Morobe District: Boana, alt. about 1000 m., Clemens 41715 (US). NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., Brass 13720 (A, US) (occasional in young seral rain-forest on sandy flood banks).

The Carolines to New Guinea and the Philippines.

Closely related to *Microstegium gratum* (Hack.) A. Camus, but differing in having glabrous culms, sheaths often papillose-pilose on the margins, and much more numerous racemes. *Microstegium gratum* has culms pubescent below the nodes and inflorescence, the awn of the fertile lemma stout and distinctly geniculate, and anthers about 3 mm. long. The Brass specimen was cited as *M. gratum* by Chase (18, p. 88). The specimens cited as *Pollinia grata* Hack. by Ridley (62, p. 249) and White (75, p. 15) may also represent *M. spectabile*. I have seen no specimens of *M. gratum* from New Guinea.

2. *Microstegium ciliatum* (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921.

*Pollinia ciliata* Trin., Mém. Acad. St. Pétersb. VI. 2: 306. 1832. Type from India.

Culms slender, 60–100 cm. tall, glabrous or the nodes sometimes puberulent; sheaths shorter than the internodes, glabrous or rarely pilose near the margins, the hairs sometimes papillose-based; ligule membranous, brownish, puberulent, 1–2 mm. long; blades linear-lanceolate, 5–10 cm. long, 4–10 (rarely to 15) mm. wide, acuminate, the base narrowed into a short petiole; racemes 2–10, 4–8 cm. long, approximate, the rachis ciliate, readily disarticulating, the joints slightly shorter than the spikelets; sessile spikelets 3–4.5 mm. long; first glume dorsally grooved, acute or bidentate; second glume acute or with a short awn; sterile lemma minute or wanting; fertile lemma minute, bearing a well developed awn; anthers about 1.5 mm. long.

2a. *Microstegium ciliatum* (Trin.) A. Camus var. *laxum* (Nees ex Steud.) comb. nov.

*Pollinia laxa* Nees ex Steud., Syn. Pl. Glum. 1: 401. 1854. Type from India.

*Andropogon breviaristatus* Steud., Syn. Pl. Glum. 1: 397. 1854. Based on *P. laxa*.

*Pollinia ciliata* Trin. var. *laxa* (Nees ex Steud.) Hack. in DC., Monogr. Phan. 6: 176. 1889.

*Microstegium breviaristatum* (Steud.) Keng, Sinensia 3: 92. 1932.

*Microstegium ciliatum* (Trin.) A. Camus var. *latifolium* Ohwi, Bot. Mag. (Tokyo) 56: 10. 1942. Type from Netherlands New Guinea.

Differing from the species in having rachis joints only shortly ciliate, the first glume bidentulate, and the second glume bearing a capillary awn 1–4 mm. long; awn of the fertile lemma slender, flexuous, 8–20 mm. long.

NETHERLANDS NEW GUINEA: Waren, 60 miles south of Manokwari, *Kanehira & Hatusima 13243* (A, type collection of *M. ciliatum* var. *latifolium*) (in rain-forest).

3. *Microstegium nudum* (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921.

*Pollinia nuda* Trin., Mém. Acad. St. Pétersb. VI. 2: 307. 1832; Hack. in DC., Monogr. Phan. 6: 178. 1889. Type from India.

*Eulalia nuda* (Trin.) Kuntze, Rev. Gen. 2: 775. 1891.

Culms very slender, decumbent and rooting at the nodes; sheaths glabrous or minutely pubescent, the margins often ciliate; ligule membranous, about 0.2 mm. long; blades lanceolate or linear-lanceolate, 1.5–6 cm. long, 4–8 mm. wide, glabrous or the upper surface bearing scattered short papillose-based hairs; racemes 3–6, borne on a slender glabrous axis 6–12 mm. long; rachis slender, trigonous, glabrous, the joints about one and one-half times longer than the sessile spikelet, the slender glabrous pedicels one-third to half as long as the rachis joints; spikelets narrowly lanceolate, about 4 mm. long, glabrous except for the very short hairs on the callus; first glume 4–6-nerved, acute or bidentulate; second glume 1–3-nerved, minutely aristulate, prominently keeled on the back; sterile lemma hyaline, nerveless, about as long as the glumes; fertile lemma about one-fourth shorter, 1-nerved, the nerve extending into a very slender flexuous awn 8–15 mm. long.

NORTHEAST NEW GUINEA: Morobe District: Samanzing, alt. about 1600 m., *Clemens 10279* (US) (on steep open trail).

India to Japan, Formosa, and Malaysia.

### 30. *Pogonatherum* Beauv.

*Pogonatherum* Beauv., Ess. Agrost. 56. pl. 11, fig. 7. 1812.

Spikelets paired, one sessile and perfect, the other pediceled and pistil-



late, falling free from the pedicel, the sessile spikelet falling with the rachis joint and the pedicel of the upper spikelet; glumes membranous, subequal, the first 3-nerved, truncate, ciliate, the second 1-nerved, keeled and bearing a long slender awn from just below its bifid apex; lemmas hyaline, the sterile empty or wanting, the fertile bifid and bearing a long slender awn equaling or exceeding that of the second glume; stamens 2 or 1. Rather low and slender perennials with terminal solitary spikelike racemes.

TYPE SPECIES: *Pogonatherum saccharoideum* Beauv. = *P. paniceum* (Lam.) Hack. (*Saccharum paniceum* Lam.).

1. *Pogonatherum paniceum* (Lam.) Hack., Allg. Bot. Zeitschr. 12: 178. 1906; Hitchc., Proc. Linn. Soc. N. S. Wales 54: 145. 1929.

*Saccharum paniceum* Lam., Encycl. 1: 595. 1783, Illustr. 1: pl. 40, fig. 3. 1791. Type from India.

*Andropogon crinitum* Thunb., Fl. Jap. 40. pl. 7. 1784. Type from Japan.

*Pogonatherum saccharoideum* Beauv., Ess. Agrost. 56, 176. pl. 11, fig. 7. 1812; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 168. 1901. Based on *Saccharum paniceum* Lam.

*Pogonatherum crinitum* (Thunb.) Kunth, Enum. 1: 478. 1833; Hack., Denkschr. Akad. Wiss. Math.-Naturw. (Wien) 89: 492. 1913.

Culms densely tufted, 15–40 cm. tall, delicate or somewhat coarse, the nodes often white-bearded; sheaths usually long-pilose in the throat, the margins often ciliate; ligule white, membranous, puberulent, about 0.5 mm. long; blades 2–5 cm. long, 1–4 mm. wide, flat or sometimes involute, often scabrous above; racemes solitary, 15–30 mm. long, slender, whitish or yellowish, the rachis joints and pedicels white-villous, about half as long as the spikelets; spikelets 2.5–3 mm. long, the callus hairs as long as the spikelets or shorter; first glume 3-nerved, the truncate apex ciliate; second glume laterally compressed, keeled, 1-nerved, the nerve extending into a long slender awn; sterile lemma shorter than the glumes (sometimes wanting), nerveless; fertile lemma shorter than the glumes, 1-nerved, long-awned from the bifid apex; palea often as long as the lemma; stamens usually 2 (sometimes 1), the anthers about 1.5 mm. long; awns of the second glume and fertile lemma similar, about 10 mm. long.

BRITISH NEW GUINEA: Central Division: Budotobara, Brass 768 (GH, US) (wet rock crevices); Mafulu, alt. 580 m., Brass 5270 (GH, US) (crevices in river-bed rocks); Kanosia, Carr 11345 (US, NY) (river banks, low down and subject to frequent flooding); Eastern Division: Kurandi, Brass 1391 (GH, US) (small grass in crevices of river-bed rocks); Western Division: Fly River, Wm. Bauerlen 43 (US); Fly River, 528-mile camp, alt. 80 m., Brass 6810 (A, US) (occasional on rocky river banks swept by floods); Lower Fly River opposite Sturt Island, Brass 8220 (A, US) (tufted on moist cliff face). NORTHEAST NEW GUINEA: Morobe District: Clemens 6548a (A); Kajabit, Markham Valley, Clemens 10552 (US); near Finschhafen, Reeder 886 (A, US) (growing in cracks of rocks above a waterfall in a small stream, abundant in this location). NETHERLANDS NEW GUINEA: Hollandia, T. C. Baim (sine no.) in 1945 (A) (dry gravelly bank of stream); Bele River, 18 km. northeast of Lake Habbema, alt. 2350 m., Brass 11568 (A, US) (abundant on a precipitous limestone slope); Balim River, alt. 1600 m., Brass 11631 (A, US) (abundant on dry rocky ground on deforested slopes); 4 km. southwest of Bernhard Camp, Idenburg River, alt. 850 m., Brass 13479 (A, US) (abundant on a flood-swept rocky river bank); Rouffaer River, alt. about 175 m., Docters van Leeuwen 9995 (GH, NY). SOLOMON ISLANDS: San

Cristoval: Hao River, *Brass* 2893 (GH) (rock crevices on the river bank; common); Ysabel: Maruto, alt. 300 m., *Brass* 3386 (GH) (on rocks in river bed, common).

Eastern Asia, Malaysia to Australia and New Guinea.

A very distinctive little grass, usually to be found growing in rock crevices along rivers. Easily recognized by its short, solitary, yellowish panicles with 2-awned spikelets.

### 31. *Sclerandrium* Stapf & C. E. Hubb.

*Sclerandrium* Stapf & C. E. Hubb., Hook. Ic. 33: *pl.* 3262. 1935.

Spikelets paired, dimorphic, one pediceled, the other sessile, the pairs alternately arranged along a slender, not or tardily disarticulating rachis; sessile spikelet more or less persistent on the rachis, dorsally compressed, bearing two staminate flowers; first glume indurated, shorter than the second, the apex truncate, emarginate or dentate; second glume membranous, obtuse to truncate, as long as the spikelet; lemmas hyaline, the lower obtuse, the upper mucronate or awned, stamens 2; pediceled spikelet readily disarticulating from the pedicel, bearing one perfect flower; glumes equal, coriaceous; fertile lemma bearing a long geniculate awn; stamens 2; pistil with a distinct style and two long plumose stigmas. Perennials with flat linear blades and 2-several digitate or approximate racemes.

TYPE SPECIES: *Sclerandrium truncatiglume* (F. Muell. ex Benth.) Stapf & C. E. Hubb. (*Ischaemum truncatiglume* F. Muell. ex Benth.).

1. *Sclerandrium truncatiglume* (F. Muell. ex Benth.) Stapf & C. E. Hubb., Hook. Ic. 33: *pl.* 3262. 1935; Chase, Jour. Arnold Arb. 20: 314. 1939.

*Ischaemum truncatiglume* F. Muell. ex Benth., Fl. Austral. 7: 518. 1878. Type from Australia.

Culms caespitose, 3-5-noded, 80-150 cm. tall, glabrous; sheaths firm, shorter than the internodes, glabrous or slightly pilose in the throat; ligule membranous, about 1 mm. long; blades as much as 50 cm. long, 5-10 mm. wide, acuminate, the base attenuate, the upper surface sparsely pilose toward the base, otherwise glabrous; racemes 3-6, erect, 8-12 cm. long, the common axis about 1.5 cm. long; rachis slender, pilose, the internodes about 3 mm. long; sessile spikelets 5-6.5 mm. long; first glume 3.5-5 mm. long, truncate to 2-3-toothed, smooth and shining on the back, ciliate with white hairs 1-2 mm. long on the margins and apex, inside 5-7-nerved, the nerves anastomosing below the apex; second glume short-appressed-pilose, the hairs longer on the margins and toward the apex; lower lemma lanceolate, 4-5 mm. long, the palea similar but slightly wider, both more or less pubescent; upper lemma slightly shorter than the fertile, the apex bearing an awn up to 3 mm. long, the lemma and slightly longer palea more or less pubescent; pediceled spikelet 3-3.6 mm. long, the slender pilose pedicel about 2 mm. long, the spikelet disarticulating obliquely with a sharp-pointed brown hairy callus; glumes brown, pilose, with spreading whitish hairs about 1 mm. long; fertile lemma with an awn 16-25 mm. long, the column 5-9 mm. long, spreading-pilose with white hairs about 1 mm. long.

BRITISH NEW GUINEA: Western Division: Tarara, Wassi Kussa River,



*Brass* 8537 (A, US) (uncommon on savannah-forest ridges), *Brass* 8665 (A, US) (occasional on banks of streams in savannah forest).

Australia and New Guinea.

### 32. *Ischaemum* L.

*Ischaemum* L., Sp. Pl. 1049. 1753, Gen. Pl. ed. 5. 469. 1754.

*Meoschium* Beauv., Ess. Agrost. 111. pl. 21, fig. 4. 1812.

Spikelets paired, one sessile or subsessile and perfect, falling with the rachis joint and the pedicel of the upper spikelet, the other pediceled, staminate or perfect, falling free from the pedicel; rachis joints and pedicels trigonous or rarely convex on the back, usually ciliate along the edges; glumes firmly indurate, the first flat or slightly rounded on the back, the margins inflexed; second glume cymbiform, keeled on the back or rarely rounded, the apex acuminate or aristate; sterile lemma membranous or hyaline, enclosing a palea and a staminate flower; upper floret perfect or pistillate, the lemma hyaline, usually 2-cleft and awned from the base of the cleft; first glume of the pediceled spikelet often with one margin strongly inflexed, the glume thus appearing laterally compressed. Annuals or perennials with usually binate or digitate (rarely solitary) racemes.

TYPE SPECIES: *Ischaemum muticum* L.

#### KEY TO THE SPECIES

1. Racemes solitary or binate.
2. Racemes binate, often closely appressed and appearing as a solitary cylindrical spike; rachis joints and pedicels trigonous.
3. Culms prostrate, creeping; fertile lemma mucronate or with a short straight (3 mm. long or less) awn from the apex.....3. *I. muticum*.
3. Culms erect or ascending; fertile lemma deeply cleft and bearing a geniculate and twisted awn from the base of the cleft.
4. Plants 60–150 cm. tall; first glume of pediceled spikelet acute or bifid, not aristate.
5. Sessile spikelet (including the callus) 7–9 mm. long; rachis joints about 5 mm. long; first glume stramineous or brownish.....1. *I. aristatum*.
5. Sessile spikelet (including the callus) about 6 mm. long; rachis joints about 4 mm. long; first glume purple-flecked.....2. *I. pubescens*.
4. Plants 20–40 cm. tall; both glumes of pediceled spikelet aristate; callus yellow-bearded.
6. Second glume of the sessile spikelet with an awn 5–6 mm. long; glumes of the pediceled spikelets long-pilose on the keels, aristate, the awns 3–4 mm. long.....4. *I. foliosum*.
6. Second glume of the sessile spikelet with an awn only 1–2 mm. long; glumes of the pediceled spikelets scabrous on the keels, short-aristate, the awns only 0.5–1 mm. long.....5. *I. littorale*.
2. Racemes solitary; rachis joints and pedicels hemispheric-convex on the back, the inner cavity closed by a thin hyaline membrane.....9. *I. fragile*.
1. Racemes 3–7, digitate or approximate.
7. Sessile spikelet with a well developed geniculate and twisted awn; first glume stramineous or brownish.
8. Sessile spikelet with a geniculate awn; pediceled spikelet mucronate or with a short straight awn.....7. *I. digitatum*.

8. Both sessile and pediceled spikelets with well developed geniculate awns....  
.....S. *I. intermedium*.  
7. Sessile spikelet with a straight awn 5-6 mm. long; pediceled spikelet awnless;  
first glume purple-flecked.....6. *I. Turneri*.  
1. *Ischaemum aristatum* L., Sp. Pl. 1049. 1753; Blatter & McCann, Imp. Council  
Agric. Res. Sci. Monogr. 5: 11-12, pl. 6. 1935; Hitchc., Brittonia 2: 126. 1936.  
Type from China.

*Ischaemum arundinaceum* F. Muell. ex Benth., Fl. Austral. 7: 519. 1878; Chase,  
Jour. Arnold Arb. 20: 313. 1939. Type from Australia.

Culms erect or decumbent at base, 60-150 (sometimes to 200) cm. tall, stout or rather slender, the internodes often pruinose; nodes glabrous or bearded; sheaths keeled above, usually glabrous, the margins extending into auricles 3-6 mm. long connected by the membranous, often somewhat shorter ligule; blades linear-lanceolate, 10-30 cm. long, 8-15 (rarely to 20) mm. wide, acuminate, the base sometimes rounded or subcordate but more often gradually tapering, usually glabrous on both surfaces (rarely somewhat pubescent), the margins scabrous; racemes 2, erect, usually closely appressed and appearing more or less as one cylindrical spike, 5-15 cm. long; rachis joints about 5 mm. long, 3-angled and ciliate on the angles; pedicels somewhat shorter, similar to the rachis joint and parallel to it; sessile spikelets stramineous or brownish, oblong, 7-9 mm. long including the bearded callus; first glume nearly smooth to more or less prominently rugose below, striate above, the keels winged; fertile lemma cleft to the middle and bearing from the base of the cleft a twisted and geniculate awn 10-15 mm. long; pediceled spikelets slightly shorter, usually broadly winged along the external keel, awnless.

BRITISH NEW GUINEA: Western Division: Wuroi, Oriomo River, alt. 10-30 m., *Brass* 5726 (GH, US) (common amongst bushy growth on fringe of forest); Lake Daviumbu, Middle Fly River, *Brass* 7900 (A, US) (dominating [often the only grass] over large areas of low savannah and wet grass plains); Lower Fly River, *Brass* 8259 (A, US) (common in savannah forests); Tarara, Wassi Kussa River, *Brass* 8751 (A, US) (not common in savannah forests).

India to China, the Philippines, Malaysia, New Guinea, to Australia.

Typical *Ischaemum aristatum* from China has the lower part of the first glume prominently transversely rugose or at least with rather prominent marginal undulations. In *I. arundinaceum* from Australia the first glume is smooth or with only weak undulations on the margins. In all other respects these two species are practically indistinguishable. Since there is no other character on which to separate these "species" except the presence or absence of undulations on the first glume, and in that it seems to be a matter only of degree, they are considered here to be components of one variable species. The New Guinea material varies from having the first glume smooth to rather noticeably undulate.

- 1a. *Ischaemum aristatum* L. subsp. *barbatum* (Retz.) Hack. in DC., Monogr. Phan. 6: 204. 1889; Chase, Jour. Arnold Arb. 20: 314. 1939.

*Ischaemum barbatum* Retz., Obs. Bot. 6: 35 [error for 25]. 1791. Type from Java.

Differing from the species in having sessile spikelets more or less dorsally villous, and pediceled spikelets glabrous or villous. The sheaths are often pilose.

BRITISH NEW GUINEA: Western Division: Dagwa, Oriomo River, alt. 40 m., *Brass* 5928 (A, US) (forming large patches on open slopes); Gaima, Lower



Fly River, *Brass* 8260 (A, US) (occasional in savannah forest grass cover); Daru Island, *Brass* 6040 (GH, US) (very abundant on wet savannahs of center of Island), *Brass* 6253 (A, US) (frequent in tall grass cover of savannah forests). NETHERLANDS NEW GUINEA: Hollandia and vicinity, alt. 20-100 m., *Brass* 8815 (A, US) (covering extensive deforested slopes in association with *Gleichenia* sp. or in pure stands).

Indo-Malayan region to New Guinea.

This subspecies is distinguishable on no other character than the pilose first glume. I suspect that this is not reliable and that plants may be pilose when young and become glabrous in age. *Ischaemum barbatum* Retz. var. *arfakense* (Rendle) Ohwi (56, p. 11) is probably this subspecies. *Brass* 6040 has exceptionally hairy sheaths and was reported as *I. aristatum* var. *Meyenianum* (Nees) A. Camus, by Hitchcock (35, p. 126). *Brass* 8260 was reported as *I. pubescens* by Chase (17, p. 314).

2. *Ischaemum pubescens* Merr., Philip. Jour. Sci. Bot. 9: 264. 1914. Type from the Philippines.

Perennial; culms glabrous, pruinose below the nodes, 70-100 cm. tall, the nodes bearded; sheaths rather loose, the lower softly pilose, the upper more or less glabrous, the margins extending into auricles 2-3 mm. long connected by the brown hyaline ligule; blades softly pilose on both surfaces, the margins scabrous, 10-18 cm. long, 6-12 mm. wide, acuminate, the base of the upper rounded, of the lower gradually narrowed; racemes 2, closely appressed, 6-10 cm. long, long-exserted; rachis joints about 4 mm. long, 3-angled, ciliate-pilose on the angles; pedicels similar, about 3 mm. long; sessile spikelets oblong, about 6 mm. long including the callus, 1.8 mm. wide, the callus white-bearded; first glume indurate, the base with two obscure undulations, the upper half winged, the wings serrulate-scabrous, the back purple-flecked and usually bearing a few scattered hairs; second glume keeled on the back, indurate like the first; lemmas hyaline, the sterile entire, the fertile cleft to the middle and bearing in the cleft a geniculate twisted awn 8-13 mm. long; pediceled spikelets of about the same size and color as the sessile, the first glume sparingly pilose on the back, broadly winged on one side, the wing serrulate scabrous.

NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass* 11617 (A, US) (one of the most abundant grasses on deforested slopes), *Brass* 11732 (A, US) (very abundant, sometimes dominant on sandy soil of deforested slopes).

Philippines, New Guinea.

Closely allied to *Ischaemum aristatum* L. subsp. *barbatum* (Retz.) Hack. but distinguishable by its smaller spikelets with the first glume purplish-flecked rather than stramineous, the shorter rachis joints, and the pilose blades.

3. *Ischaemum muticum* L., Sp. Pl. 1049. 1753; K. Schum., Bot. Jahrb. 9: 197. 1887; Hack. in DC., Monogr. Phan. 6: 212. 1889. Type from India.

Perennial; culms long-prostrate, glabrous and often pruinose, the ascending flowering branches 15-50 cm. tall; upper sheaths overlapping, the lower shorter than the internodes, glabrous to more or less papillose-villous toward the margins; ligule membranous, truncate, glabrous or ciliolate, 0.5-1 mm. long; blades linear-lanceolate to lanceolate, 6-12 cm. long, 5-15 mm. wide, the base cordate and with a petiole about 1 mm. long; racemes 2, usually partly included in the upper sheaths, 2.5-4 cm. long;

rachis joints 3-angled, stout, about half as long as the sessile spikelet, the angles glabrous, scabrous, or sometimes short ciliate; pedicels about as long as the rachis joint, similar but usually slightly more slender; sessile spikelet glabrous, smooth and shining, 7-9 mm. long including the 1.5-2 mm. long callus; glumes firmly indurate, the first obovate-lanceolate, the apex acute or shortly bidentate, the keels on the upper half with broad membranous wings; second glume prominently wing-keeled, acute or shortly aristate; sterile lemma chartaceous, the margins with a hyaline wing toward the apex, the palea of like texture but slightly longer; fertile lemma membranous, mucronate or with an awn as much as 3 mm. long, the palea of like texture; pediceled spikelet about 6 mm. long, perfect or rarely sterile.

BRITISH NEW GUINEA: Central Division: Hula, *Brass* 514 (GH, US) (a sand binding grass; just above tide mark); Hisiu, *Carr* 11413 (NY) (sandy beach); Eastern Division: Bomgwina, *Brass* 1616 (GH, US) (common beach grass); Gulf Division: Vailala, *Brass* 1177 (GH, US) (very common on the beaches); Western Division: Coast between Oriomo and Fly Rivers, *Brass* 6410 (A, US) (abundant as a sand binder on beaches). NORTHEAST NEW GUINEA: Morobe District: Finschhafen, *Weinland* 347 (US). NEW BRITAIN: R. Parkinson 47 (US); Rabaul, *Herre* 185 (NY) (seashore). SOLOMON ISLANDS: San Cristoval: Waimamura, *Brass* 2646 (GH) (on cleared land near the sea, abundant).

India to Australia, New Guinea and many Pacific Islands.

4. *Ischaemum foliosum* Hack. in DC., *Monogr. Phan.* 6: 222. 1889. Habitat in New Ireland and New Caledonia.

*Ischaemum murinum* var. *spiculis majoribus* Balansa, *Bull. Soc. Bot. France* 19: 323. 1872. Habitat in New Caledonia.

Culms rather slender, ascending from creeping bases, 20-30 cm. tall, the nodes bearded with ascending white hairs 3-5 mm. long; sheaths longer than the internodes, slightly keeled above, toward the margins papillose-pilose with white hairs 4-5 mm. long; ligule membranous, ciliate, 0.5-1 mm. long; blades linear to sub lanceolate-linear, 4-8 cm. long, 4-7 mm. wide, acuminate, narrowed toward the base, glabrous below, the upper surface somewhat glaucous and papillose-pilose toward the base; racemes binate, about 3 cm. long; rachis joints and pedicels trigonous, rather stout, 2.5-3 mm. long, the angles ciliate with yellow hairs 2-3 mm. long, the callus densely bearded with similar hairs; sessile spikelet lanceolate, about 6 mm. long including the callus; first glume acuminate, bimucronate, the basal part glabrous, the upper two-thirds scabrous, the narrow keel wings ciliolate-scabrous; second glume equal to the first, somewhat rounded on the back, bidentate, bearing from between the teeth an awn 5-6 mm. long; sterile lemma slightly shorter than the glumes; fertile lemma bifid, the teeth 1-1.5 mm. long, awn 18-20 mm. long, the column about 6 mm. long; pediceled spikelet with both glumes long-pilose on the keels, aristate, the awn 3-4 mm. long; awn of the upper lemma like that of the sessile spikelet.

New Ireland to New Caledonia.

The only specimen seen was a duplicate of the second specimen cited in the original description (*Balansa* 707).<sup>19</sup> The description was drawn up

<sup>19</sup> Specimen from the Hackel Herbarium in Vienna now deposited in the United States National Herbarium.



from this plant and from Hackel's original description. Included in this paper since the first cited specimen was from New Ireland.

5. *Ischaemum littorale* sp. nov. PLATE VII. Figs. a-c.

Perennis 20–40 cm. alta; culmis glabris, caespitosis, erectis vel ascendentibus; nodis supra albo-barbatis, inferne demum glabris; vaginis supra carinatis, quam internodiis plerumque longioribus, papilloso-pilosis, pilis laxis et longis; ligula membranacea, ciliolata, circiter 1 mm. longa; laminis planis vel plus minusve involutis, 3–8 cm. longis, 2–4 mm. latis, acuminatis, basin versus leviter angustatis, subtus scabris, supra papilloso-pilosis, pilis albis, laxis, marginibus glabris vel apicem versus scabris; racemis binatis, longe exsertis, 2–4 cm. longis; articulis pedicellisque subaequalibus, trigonis, 2.5–3 mm. longis, utroque latere circiter 0.5 mm. lata, angulis exterioribus dense ciliatis, pilis luteis circiter 1 mm. longis; spicula sessili straminea vel fulva, callo 1 mm. longo incluso circiter 5 mm. longa; glumis subaequalibus gluma prima anguste lanceolata, apice acuminata, bifida, carinata anguste alata, dorso plana, glabra, inferne levi, superne scaberula, praeter carinas 2–3-nervia; gluma secunda dorso inferne convexa, superne carinata, carina scaberrima, alioquin glabra levi, infra apicem minute bidentatum aristulam 1–2 mm. longam exserente; lemmate sterili 3-nervio, quam glumis paullo brevior, palea quam lemmate paullo brevior, antheris circiter 2 mm. longis; lemmate fertili quam lemmate sterili paullo brevior, in  $\frac{1}{2}$  superiore bifido, arista 15–20 mm. longa, columna fusca circiter 5 mm. longa; stigmatibus circiter 3 mm. longis, staminibus abortivis; spicula pedicellata lanceolata, glumis aequalibus vel subaequalibus, acuminatis, mucronatis vel aristatis, arista ad 1 mm. longa.

SOLOMON ISLANDS: San Cristoval: Waimamura, Brass 2593 (GH, TYPE), August 5, 1932 (among coral rocks just above high water mark, common), Brass 2813bis (GH).

*Ischaemum littorale* is of the alliance of *I. foliosum*, from which it differs in having narrower blades, which are papillose-pilose above rather than glabrous, more slender rachis joints and pedicels, which bear shorter hairs on the outer angles, and in the much shorter awn on the second glume of the sessile spikelet. A further difference is seen in the pediceled spikelets, which have glumes bearing awns only up to 1 mm. long rather than 3–4 mm. long as in *I. foliosum*.

Comparison may also be made with *Ischaemum aureum* (Nees) Hack., but that species has glabrous nodes and sheaths, blades which are glabrous or only sparsely pilose at the base and on the margins, larger spikelets in which the second glume bears an awn about twice as long as that of *I. littorale*, and glumes of the pediceled spikelets long-ciliate on the keels.

6. *Ischaemum Turneri* Hack. in DC., Monogr. Phan. 6: 232. 1889; K. Schum., Notizbl. Bot. Gart. Berlin 1: 206. 1896. Type from New Ireland.

Sheaths glabrous, shorter than the internodes; ligule glabrous with a row of hairs in back of it; blades 10–15 cm. long, 12–18 mm. wide, more or less rigid, at first clothed with appressed hairs, becoming glabrous, the margins scabrous; racemes 3–4, 4–7 cm. long; rachis joints and pedicels about equal or the pedicel slightly longer, both trigonous, stout, ciliate on

the interior angles, somewhat bowed out at the base and slightly excavated within, leaving a small oblong opening between them; sessile spikelet 8–9 mm. long including the 1.8 mm. long glabrous callus; first glume purple-flecked on the back, narrowly winged on the upper half, the wings ciliate-scabrous, the apex acuminate, entire; second glume equal to the first, rounded on the back and with a narrowly winged keel toward the apex; fertile lemma with a straight awn 5–6 mm. long; pediceled spikelet about 7 mm. long, similar to the sessile but the fertile lemma only mucronate, not awned.

NEW IRELAND: *Turner* (fragment of the TYPE specimen consisting of three rachis joints with three sessile and two pediceled spikelets attached) <sup>20</sup> (US).

New Britain, New Ireland, and New Caledonia.

No specimen was seen other than the small fragment cited. The description is a modification of the original by Hackel. Unfortunately Hackel was unable to give the height of the plant or any indication of its habit, since his description was based on a fragmentary specimen.

7. *Ischaemum digitatum* Brongn. in Duperry, Bot. Voy. Coquille 2: 70. *pl.* 13. 1831; Hack., Bot. Jahrb. 6: 238. 1885, in DC., Monogr. Phan. 6: 233. 1889. Type from the Moluccas.

Culms glabrous, ascending from a decumbent base, as much as 2 meters tall; the nodes sometimes sparsely bearded; sheaths keeled at least above, rather loose, glabrous or sparsely pilose; ligule membranous, 2–3 mm. long; blades linear-lanceolate, 15–30 cm. long, 6–15 (rarely to 20) mm. wide, glabrous, the margins scabrous; racemes 4–7 (rarely only 3), 5–8 cm. long; rachis joints and pedicels about equal, trigonous, the angles scabrous or short-ciliate, about 4 mm. long, bowed out equally at the base and slightly excavated within leaving a round or oblong opening between them; sessile spikelet 5–7 mm. long including the 1.5 mm. callus, 1.5 mm. wide, first glume smooth and shining below, the upper two-thirds striate, scabrous, the apex bidentate, the keels winged; second glume rounded on the back, narrowly wing-keeled toward the apex; sterile lemma as long as the glumes, acuminate; fertile lemma deeply cleft and bearing a geniculate twisted awn from the base of the cleft, the awn bent below the middle; pediceled spikelets similar but the fertile lemma entire or only slightly cleft, the awn short, not geniculate.

BRITISH NEW GUINEA: Central Division: Veiya, *Carr 11736* (NY) (river bank in the open); Western Division: Lake Daviumbu, Middle Fly River, *Brass 7528* (A, US) (savannahs; dominant grass of swamp margins); Daru Island, *Brass 6339* (A, US) (gregarious and dominant over a small wet-season swamp in savannah forest). NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, alt. 2200 m., *Brass 11385* (A, US) (covering the moister parts of old garden clearings); Balim River, alt. 1600 m., *Brass 11806* (A, US) (dominant grass on formerly cultivated river flats).

Malaysia to Polynesia.

- 7a. *Ischaemum digitatum* Brongn. var. *polystachyum* (Presl) Hack. in DC., Monogr. Phan. 6: 233. 1889.

*Ischaemum polystachyum* Presl, Rel. Haenk. 1: 328. 1830. Type from the Marianas.

Differing from the species in having prominently bearded nodes, the <sup>20</sup> Fragment from the Berlin Herbarium, with no precise locality, collector's number, or date. The specimen was labeled "*Ischaemum Turneri*" in Hackel's hand.



sheaths densely pilose and the rachis joints and pedicels ciliate with long stiff hairs on the outer angles.

BRITISH NEW GUINEA: Central Division: Urunu, Vanapa Valley, alt. 1900 m., *Brass* 4808 (US) (a few plants in small grassland swamps); Mafulu, alt. 1250 m., *Brass* 5532 (GH, US) (common in regrowth brush on old garden lands); Gulf Division: Kerema, *Brass* 1213 (GH, US) (open grassland near the coast); Northern Division: About 1 mile north of East Embi Lake, *Reeder* 845 (A, US) (not common, low ground of grassland). NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass* 13721 (A, US) (occasional in rain-forest seral growths on sandy flood banks). NEW BRITAIN: Talasea, near Waru village, alt. 200 m., *Burcham* 140 (US) (sandy loam soil under coconut trees, abundant in this locality).

The Marianas to Malaysia and New Guinea.

Hitchcock (35, p. 126) reported *Brass* 4808 and 5532 as *Ischaemum ciliare* Retz., but the second specimen is certainly *I. digitatum*. The identity of the other (*Brass* 4808) cannot be certain, since the plant is infected with a fungus and appears to be abnormal. The specimen is like *I. ciliare* in having only two racemes, but in that species both the pediceled and sessile spikelet have well developed geniculate awns. The *Brass* specimen has a well developed geniculate awn on the sessile spikelet, but the pediceled spikelet has only a short straight awn. Since the spikelets are those of *I. digitatum*, it seems best to refer the specimen to this species, especially since *I. ciliare* is not otherwise known from New Guinea.

8. *Ischaemum intermedium* Brongn. in Duperry, Bot. Voy. Coquille 73. 1831; Hack., Bot. Jahrb. 13: 261. 1891. Type from the Carolines.

Similar to *I. digitatum* in having 4-6 racemes, but a somewhat smaller species, in which the sessile spikelets have the apex of the first glume acuminate and entire rather than bifid. Both the sessile and pediceled spikelets have a well developed geniculate awn, although that of the sessile spikelet is often larger.

The Carolines to the Moluccas and New Guinea. Also in the Philippines.

Reported from New Guinea, but I have seen no specimen which could be distinguished from *I. digitatum*.

9. *Ischaemum fragile* R. Br., Prodr. Fl. Nov. Holl. 1: 205. 1810; C. E. Hubb., Hook. Ic. 33: pl. 3263. 1935; Hitchc., Brittonia 2: 127. 1936. Type from Australia.

*Digastrium fragile* (R. Br.) A. Camus, Bull. Soc. Bot. France 70: 850. 1923.

Perennial; culms glabrous, 40-110 cm. long, erect or ascending from a geniculate base, 3-7-noded, the nodes often bearded; sheaths keeled, glabrous to more or less pilose; ligule membranous, 2-3 mm. long, tapering to the obtuse, often ciliate apex; blades flat, linear, as much as 20 cm. long, 3-7 mm. wide, acuminate, the base long-attenuate, both surfaces glabrous to more or less densely pubescent, the margins usually scabrous; racemes solitary, 4-6 cm. long, long-exserted when mature; joints of the rachis and pedicels about equal, the pedicel slightly narrower, 3.5-4 mm. long, hemispheric-convex on the back, the inner cavity closed by a thin hyaline membrane, the margins and often the dorsal mid-line pilose; sessile spikelet 5-6 mm. long including the densely bearded callus; first glume emarginate, the upper part with two prominent wings, the lower half smooth and shining, the upper striate; second glume with a short

wing on the upper part of the keel, the apex with an awn 1–3 mm. long; sterile lemma hyaline, its palea firmer and enclosing a staminate flower; fertile lemma deeply cleft and bearing a twisted and geniculate awn from the base of the cleft, the awn 10–18 mm. long; pediceled spikelets reduced, smaller than the sessile, bearing a staminate flower or sometimes reduced to the glumes.

BRITISH NEW GUINEA: Western Division: Dagwa, Oriomo River, alt. 40 m., *Brass* 5961 (US) (rare on damp soil on open ridges); Mabaduan, *Brass* 6486 (A, US) (common in primary savannah-forest grass cover; most abundant in old garden lands); Lake Daviumbu, Middle Fly River, *Brass* 7874 (A, US) (rare on savannahs of this locality), *Brass* 7934 (A, US) (rare grass on wet savannahs).

Australia and New Guinea.

### 33. *Apluda* L.

*Apluda* L., Sp. Pl. 82. 1753, Gen. Pl. ed. 5. 35. 1754 (non Beauv. 1812).

*Calamina* Beauv., Ess. Agrost. 128. pl. 23, fig. 1. 1812.

Racemes solitary at the ends of the branches of a leafy open paniculate inflorescence, each partly enclosed in a swollen bract or spathe, reduced to one joint bearing three spikelets, one sessile and perfect, the others borne on flattened glume-like pedicels, one of the pediceled spikelets reduced to a minute flattened glume, the other staminate or neuter (rarely perfect) and as large as the sessile one; sessile spikelet with a thickened rounded callus, the first glume indurated, obtuse, rounded on the back, the margins somewhat inrolled; second glume membranous, gibbous below, the keel depressed above; lower floret staminate, the lemma hyaline, about as long as the glumes, the palea nearly as long, 2-nerved; upper floret perfect, the lemma gibbous on the back, 1-nerved, awnless or short-awned, the palea about half as long; pediceled spikelet similar but both glumes somewhat indurate and the tip of the second glume not depressed. A straggling much branched perennial.

TYPE AND ONLY SPECIES: *Apluda mutica* L.

1. *Apluda mutica* L., Sp. Pl. 82. 1753; F. Muell., Pap. Pl. 1: 46. 1876. Type from India.

*Apluda varia* Hack. subsp. *mutica* Hack. in DC., Monogr. Phan. 6: 197. 1889.

Culms glabrous, 1–2 meters long, wiry, weak and straggling, decumbent at base, geniculately ascending, usually leaning on other vegetation; sheaths glabrous, usually shorter than the internodes; ligule membranous, 1–2 mm. long; blades scabrous, linear, 10–40 cm. long, 3–10 (rarely to 15) mm. wide, acuminate, the apex often setaceous, the base gradually narrowed into a short petiole; inflorescence narrow, often zig-zag, the axis very slender; spikelets 3–4 mm. long, these and the cymbiform spathes often pruinose.

BRITISH NEW GUINEA: Central Division: Hula, *Brass* 522 (GH, US) (damp hollows in coast sandhills); Roana, Laloki River, alt. 450 m., *Brass* 3613 (A, US) (rocky savannahs, not plentiful); Maiulu, alt. 1250 m., *Brass* 5403 (GH, US) (common, straggling amongst tall *Imperata* on artificial grass slopes); Veiya, Carr 11741 (NY) (open country); Port Moresby, *MacFarlane* 48 (US), *C. T. White* 30 (US); Northern Division: Ambasi, *King* 1018 (US); about 9 miles northwest of Oro Bay, *Reeder* 819 (A, US) (common in grassland); Western Division: Dagwa, Oriomo River, alt. 40 m., *Brass* 5957 (GH, US) (growing amongst coarse grasses on an old garden site on open savannah); Daru Island, *Brass*



6431 (A, US) (rare in savannah forests); Lake Daviumbu, Middle Fly River, *Brass* 7771 (A, US) (few plants in old village clearing); Goodenough Island: Haiwali, alt. 30 m., *Burcham* 119 (US) (two miles inland on coastal plain, grassy clearing in rain forest). NORTHEAST NEW GUINEA: Morobe District: Finschhafen, *Warburg* 20968 (A), *Weinland* 290 (US); near Kajabit Mission, alt. about 500 m., *Clemens* 10631 (US). NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass* 11798 (A, US) (plentiful subsidiary grass on deforested slopes).

India to China, Formosa, the Philippines, Malaysia, New Guinea, and New Caledonia.

### 34. *Hackelochloa* Kuntze

*Hackelochloa* Kuntze, Rev. Gen. 2: 776. 1891.

*Manisuris* L. f., Nov. Gram. Gen. 37. 1779 (non L., Mant. 2: 164. 1771).

*Rytidix* Raf., Bull. Bot. Seringe 1: 219. 1830.<sup>20a</sup>

Spikelets in pairs, dimorphic, awnless, one sessile and perfect, the other pediceled, staminate or neuter; rachis fragile, readily disarticulating, the joints and pedicels firmly grown together, the two clasped between the edges of the coriaceous, subhemispheric, foveolate first glume of the sessile spikelet; second glume chartaceous and set in a cavity in the slightly hollowed out fused rachis joint and pedicel and more or less adnate to it; lemmas hyaline, the lower empty, the upper perfect; pediceled spikelets conspicuous, ovate, the glumes membranous, green. Annuals with freely branching culms, flat blades, and numerous solitary spikelike racemes borne on the ends of slender fascicled spatheate branches.

TYPE SPECIES: *Hackelochloa granularis* (L.) Kuntze (*Cenchrus granularis* L.).

1. *Hackelochloa granularis* (L.) Kuntze, Rev. Gen. 2: 776. 1891; Hitchc., U. S. Dept. Agric. Misc. Publ. 200: 764. fig. 1689. 1935, Brittonia 2: 127. 1936. *Cenchrus granularis* L., Mant. 2: 575. 1771. Type from India.

*Manisuris granularis* (L.) L.f., Nov. Gram. Gen. 40. pl. 1, fig. 4-7. 1779; Swartz, Prodr. Veg. Ind. Occ. 25. 1788; Beauv., Ess. Agrost. pl. 21, fig. 10. 1812; K. Schum., Notizbl. Bot. Gart. Berlin 2: 90. 1898.

Culms more or less decumbent, 20-100 cm. tall, glabrous or sparsely hispid; sheaths rather loose, keeled, papillose-hispid; blades lanceolate-linear, flat, papillose-hispid like the sheaths, 5-15 cm. long, the base more or less cordate; racemes 1-2.5 cm. long, borne on slender peduncles, shortly exserted or the base included in the spathe; sessile spikelets 1-1.5 mm. long, equaling or a little longer than the rachis joints, the pediceled spikelets 1.5-2 mm. long.

BRITISH NEW GUINEA: Central Division: Baroka, Nakeo District, alt. 50 m., *Brass* 3701 (A, US) (common in shelter of taller savannah forest); Northern Division: About 8 miles northwest of Oro Bay, *Reeder* 806 (A, US) (sandy soil along old jeep road; apparently not common). NORTHEAST NEW GUINEA: Morobe District: *Clemens* 4307 (A); near Kajabit Mission, alt. 250-600 m., *Clemens* 40782 (US); Wantoat, alt. about 1000 m., *Clemens* 40867 (US).

Tropics of both hemispheres.

### 35. *Hemarthria* R. Br.

*Hemarthria* R. Br., Prodr. Fl. Nov. Holl. 1: 207. 1810.

Spikelets paired, 1-flowered, one sessile, the other pediceled, both alike

<sup>20a</sup> Not effectively published. For details see Hitchcock, Contr. U. S. Nat. Herb. 24: 506. 1927, and U. S. Dept. Agric. Bull. 772 (revised): 286. 1936.

or the pediceled spikelets narrower and attenuate, the pedicels appressed to the rachis, usually adnate to it and forming with the hollowed-out rachis joint a cavity containing the sessile spikelet; rachis disarticulating tardily or not at all; first glume coriaceous, dorsally flattened, fitting over the hollow containing the spikelet; second glume cymbiform, membranous-hyaline, more or less adnate to the rachis joint; lemmas hyaline, the lower empty, the upper (fertile) awnless, usually with a small palea; pediceled spikelet acuminate or attenuate, both glumes coriaceous, the second usually longer than the first, free, the apex attenuate or awn-pointed. Perennials with mostly decumbent culms and terminal spikelike racemes solitary on the culms and branches.

TYPE SPECIES: *Hemarthria compressa* (L. f.) R. Br. (*Rottboellia compressa* L. f.).

1. *Hemarthria subulata* sp. nov. PLATE V, Figs. c-e.

Probabiliter perennis; culmis compressis glabris erectis, ramosis, 1-1.5 m. altis; nodis 4-6; vaginis glabris plus minusve laxis, supra quam internodiis brevioribus, eis infra medium culmi plerumque quam internodiis longioribus; ligula ciliata, circiter 1 mm. longa; laminis linearibus, laxis, ad 60 cm. longis, 2-4 mm. latis, utrinsecus glabris, marginibus scabris; racemis solitariis, gracilibus, 10-20 cm. longis, rhachi tenaci sed denique plus minusve disjuncta, articula infra spiculum longe acuminato-cuspidata; spicula sessili hermaphrodita, articula aequali vel paullo brevior; gluma prima indurata, acuta, 7-nervia; gluma secunda articula plus minusve adnata, membranaceo-scariosa; lemmatibus subaequalibus; lemmate sterili quam glumis circiter quarte parte brevior, palea sterili nulla; lemmate fertili quam lemmate sterili saepe paullo brevior, palea fertili quam lemmate quarta vel tertia parte brevior; staminibus 3. antheris circiter 4 mm. longis; spicula pedicellata acuminata, quam spicula sessili angustiore, ceterum simili, pedicellis articulis saepius laxiuscule adnatis rarius liberis, spicula sessili circiter aequali; glumis induratis, prima dorso complanata, secunda cymbiformi, carinata, carina anguste alata, ceterum spicula sessili simili.

BRITISH NEW GUINEA: Western Division: Lake Daviumbu, Middle Fly River, *Brass* 7552 (A, US, TYPE) August, 1936 (in savannahs, common on margins of swamps); Dagwa, Oriomo River, *Brass* 6001 (GH, US) (rare grass on a small marshy flat).

Apparently closely related to *Hemarthria protensa* Nees ex Steud., but differing in having stiffly erect rather than decumbent culms, much longer and narrower blades with scabrous margins, a disarticulating rachis, the first glume 7-nerved, and the fertile lemma well developed rather than obsolete or only about one-fourth the length of the spikelet. *Brass* 6001 was reported as *Manisuris protensa* (Nees ex Steud.) Hitchc. (*H. protensa* Nees ex Steud.) by Hitchcock (35, p. 127).

### 36. *Eremochloa* Buse

*Eremochloa* Buse in Miquel, Pl. Jungh. 1: 357. 1854.

*Pectinaria* Hack., Nat. Pflanzenfam. II. 2: 26. 1887.

Spikelets appearing solitary at each node, but actually paired, only the sessile developing, the pediceled reduced to a glume-like or stipiform

pedicel; sessile spikelets dorsally compressed, awnless, imbricate along one side of a tardily disarticulating rachis; glumes chartaceous, the first broad, flat or only slightly rounded on the back, the margins narrowly inflexed, 2-keeled, the keels spinulose or rigidly pectinate, at least on the lower part; second glume 3-nerved, the midnerve sometimes keeled; lemmas hyaline, the lower 3-nerved, triandrous, the palea similar; fertile lemma entire, usually nerveless, the palea similar but narrower. Slender perennials with solitary terminal racemes.

TYPE SPECIES: *Eremochloa Horneri* Buse = *E. ciliaris* (L.) Merr. (*Nardus ciliaris* L.).

#### KEY TO THE SPECIES

1. First glume wingless at summit, the marginal setae longer than the width of the glume.....1. *E. ciliaris*.
1. First glume with short narrow wings just below the summit, the marginal setae usually shorter than the width of the glume.....2. *E. bimaculata*.
1. *Eremochloa ciliaris* (L.) Merr., Philip. Jour. Sci. 1: Suppl. 331. 1906; Ohwi, Bot. Mag. (Tokyo) 56: 11. 1942.  
*Nardus ciliaris* L., Sp. Pl. 53. 1753. Type from India.  
India to China, the Philippines, and (?) New Guinea.

#### 1a. *Eremochloa ciliaris* (L.) Merr. var. *elata* var. nov.

A typo culmis multo altioribus, laminis longioribus et rigidioribus arcte conduplicatis differt.

Culms erect, strongly flattened, 4-5-noded, glabrous to more or less pubescent, 75-110 cm. tall, branching from the middle and upper nodes; sheaths glabrous, shorter than the internodes, strongly keeled; ligule membranous, truncate, 0.5-1 mm. long; blades erect, firm, closely folded, as much as 25 cm. long, 3-6 mm. wide opened out; racemes 3-5 cm. long, straight or falcate; rachis joints clavate, about 2 mm. long, with a ring of short cilia at the base, otherwise glabrous; spikelets ovate, 4-5 mm. long; first glume glabrous or minutely pubescent, keels not winged, the setae more or less scabrous, longer than the width of the spikelet; sterile pedicel narrow, one-third to half as long as the spikelet.

BRITISH NEW GUINEA: Western Division: Lake Daviumbu, Middle Fly River, Brass 7808 (A, TYPE, US) Sept., 1936 (probably a rare glaucous form of the common 7849), Brass 7849 (A, US) (common on hummocks on wet grass plains).

Differs from the species in being much taller and having longer and firmer, closely folded blades.

2. *Eremochloa bimaculata* Hack. in DC., Monogr. Phan. 6: 265. 1889; Chase, Jour. Arnold Arb. 20: 314. 1939. Type from India.

Culms simple, slender, strongly flattened, tufted, 40-60 cm. tall, glabrous or sparsely pubescent; sheaths shorter than the internodes, rather densely papillose-pilose, the upper bearing reduced blades; ligule membranous, about 0.3 mm. long; blades 8-13 cm. long, 2-3 mm. wide, flat, flaccid, glabrous or more or less densely papillose-pilose; racemes 3.5-5 cm. long, the rachis undulate, the joints clavate, about half as long as the spikelets; spikelets ovate, 4-5 mm. long, the first glume glabrous or minutely pubescent on the back, the keels with short narrow brownish wings just below the apex, the setae widely spreading, mostly shorter than the width of



the glume; sterile pedicel about one-third shorter than the spikelet, abruptly acuminate, broadest in the middle.

BRITISH NEW GUINEA: Western Division: Wuroi, Oriomo River, *Brass* 5743 (A, US) (common on grey soil of savannah ridges); Tarara, Wassi Kussa River, *Brass* 8408 (A, US) (common in savannah forests).

India to Australia and New Guinea.

The cited specimens differ from Hackel's original description in having the nodes glabrous or only slightly pubescent and the blades more or less densely papillose-pilose rather than glabrous. In other respects they agree well with both the description and a fragment of the type specimen (at US). The short narrow wings just below the tip of the first glume are distinctive. *Brass* 5743 was reported by Hitchcock (35, p. 127) as *Eremochloa ciliaris*, a closely related species having culms often branching from the upper and middle nodes and the first glume not winged.

### 37. *Elyonurus* Humb. & Bonpl. ex Willd.

*Elyonurus* Humb. & Bonpl. ex Willd., Sp. Pl. 4: 941. 1806.

Spikelets strongly dorsally flattened, awnless, in pairs, one sessile and perfect, the other pediceled, similar to the sessile or (in ours) much reduced, the pair falling attached to the rachis joint; rachis usually somewhat tardily disarticulating, breaking obliquely and forming a sharp-pointed callus; rachis joints and pedicels somewhat thickened, parallel, the rachis joint concave within and with the sessile spikelet appressed to it; first glume chartaceous to weakly coriaceous, dorsally flattened and with a line of balsam glands just inside the keels, the margins inflexed around the second glume, acute or acuminate, entire or bifid with aristate teeth; second glume chartaceous, weakly keeled on the back, the apex acuminate; lemmas hyaline, the palea much reduced or wanting. Erect moderately tall perennials with solitary, spikelike, often woolly racemes.

TYPE SPECIES: *Elyonurus tripsacoides* Humb. & Bonpl.

1. *Elyonurus citreus* (R. Br.) Munro ex Benth., Fl. Austral. 7: 510. 1878; White, Proc. Roy. Soc. Queensl. 34: 15. 1923; Hitchc., Proc. Linn. Soc. N. S. Wales 54: 145. 1929.

*Andropogon citreus* R. Br., Prodr. Fl. Nov. Holl. 1: 203. 1810. Type from Australia.

? *Elyonurus papuanus* Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 171. 1901. Type from Northeast New Guinea.

Culms tufted, glabrous, slender, 50–100 cm. tall, with floriferous branches from the upper one or two nodes; sheaths shorter than the internodes, glabrous to very sparsely pubescent, often more or less pilose in the throat; ligule ciliate, about 1 mm. long; blades 10–20 cm. long, involute, subuliform, rigid, glabrous; racemes solitary on the culms and branches, 5–8 cm. long, silky-woolly from the spreading hairs on the rachis and pedicels; rachis joints 5–6 mm. long, the white hairs on the upper part 3–4 mm. long; pedicel about equal and with similar hairs; sessile spikelet 10–13 mm. long including the 2–3 mm. long, bearded callus; first glume very slightly convex on the back, glabrous or more or less pilose, the acuminate apex about as long as the body and split into two long flattened aristate teeth, the margins of the glume and the teeth pectinate with stiff hairs

as much as 1 mm. long; second glume about half as long as the first, keeled on the back, acuminate; pediceled spikelets shorter and narrower than the sessile, reduced to a pair of aristate empty glumes, the second about one-fourth shorter than the first, one margin of the first glume prominently pectinate, the other short-pectinate or merely scabrous.

BRITISH NEW GUINEA: Eastern Division: Kurandi, *Brass* 1397 (GH, US) (on old garden clearings); Western Division: Lake Daviumbu, Middle Fly River, *Brass* 7920 (A, US) (gregarious in small clumps on hard pebbly soil in savannahs).

Australia and New Guinea.

The type of *Elyonurus papuanus* has not been seen, but from the description it appears to be a synonym of *E. citreus*.

### 38. *Rottboellia* L.f.

*Rottboellia* L. f., Nov. Gram. Gen. 22. *pl.* 1. 1779 (non Scop. 1777). Nom. conserv. *Stegosia* Lour., Fl. Cochinch. 51. 1790.

Spikelets paired, awnless, one sessile and perfect, usually sunken in the cavities of the thickened articulate rachis, the other pediceled and staminate or sometimes rudimentary, the pedicels free or closely appressed to the rachis joints; joints of the rachis with a projection on the lower end fitting into a corresponding cavity in the upper end of the next lower joint; glumes coriaceous or chartaceo-membranous, the first dorsally convex or flattened, the second cymbiform, sometimes gibbous on the back; lemmas hyaline or thinly membranous, the lower staminate or neuter, the fertile 1-3-nerved and with a subequal palea. Annuals or perennials with usually stout readily disarticulating spike-like racemes solitary or fascicled in the axils of spatheate sheaths.

TYPE SPECIES: *Rottboellia exaltata* L. f.

#### KEY TO THE SPECIES

1. Pedicels flattened, very unlike the hollowed out rachis joint; sessile spikelets about 5 mm. long.....1. *R. exaltata*.
1. Pedicels similar to the rachis joints but slightly shorter, both subclavate; sessile spikelets 3-4 mm. long.....2. *R. rottboellioides*.
1. *Rottboellia exaltata* L. f., Nov. Gram. Gen. 22. *pl.* 1. 1779, Suppl. Pl. 114. 1781; Chase, Jour. Arnold Arb. 20: 314. 1939; C. E. Hubb. & Vaughan, Grass. Maurit. & Rodriguez 117. fig. 16. 1940. Type from India.  
*Manisuris exaltata* (L. f.) Kuntze, Rev. Gen. 2: 779. 1891.  
*Stegosia exaltata* (L. f.) Nash, N. Am. Fl. 17: 84. 1909.

Annual; culms erect, stout, branching, 60-200 cm. tall, glabrous or hispid below, often glaucous below the raceme; sheaths rather loose, usually densely papillose-hispid; ligule membranous, short-ciliate, about 1.5 mm. long; blades flat, linear-lanceolate, 15-50 cm. long, 5-25 mm. wide, often glaucous beneath, the margins serrulate-scabrous; racemes 8-15 cm. long, stout below and attenuate with imperfect spikelets above, scaberulous, often pale yellow except for the greenish first glume of the pediceled spikelets; joints of the rachis slightly longer than the sessile spikelets, hollowed out and the spikelet borne in the hollows; first glume about 5 mm. long, strongly indurated, emarginate, the second strongly gibbous

on the back; pediceled spikelet 3–4.5 mm. long, the pedicel somewhat flattened, about half as long as the rachis joint and closely appressed to it; first glume striate, green, obtuse or emarginate.

BRITISH NEW GUINEA: Western Division: Daru Island, *Brass* 6296 (A, US) (plentiful and forming dense brakes on wet garden land behind mangroves). Tropics of both hemispheres.

2. *Rottboellia rottboellioides* (R. Br.) comb. nov.

*Ischaemum rottboellioides* R. Br., Prodr. Fl. Nov. Holl. 1: 205. 1810. Type from Australia.

*Andropogon rottboellioides* (R. Br.) Steud., Syn. Pl. Glum. 1: 382. 1854.

*Rottboellia ophiuroides* Benth., Fl. Austral. 7: 514. 1878; K. Schum. & Hollr., Fl. Kais. Wilhelmsland 22. 1889. Based on *Ischaemum rottboellioides* R. Br.

*Manisuris rottboellioides* (R. Br.) Kuntze, Rev. Gen. 2: 779. 1891; Hitchc., Brittonia 2: 127. 1936.

*Coelorachis rottboellioides* (R. Br.) A. Camus, Ann. Soc. Linn. Lyon 68: 197. 1921.

Perennial; culms glabrous, subrobust, 1–2 meters tall; sheaths rather firm, glabrous or rarely somewhat short-pubescent, usually pubescent on the collar; ligule membranous, ciliate, 1–2 mm. long; blades 25–50 cm. long, 8–20 mm. wide, both surfaces glabrous (rarely more or less short pubescent), the margins serrulate-scabrous; racemes 6–8 cm. long, terminal on slender fascicled spatheate branches; joints of the rachis about one-fourth shorter than the sessile spikelets, subclavate, slightly keeled on the back, the inside somewhat concave; pedicels similar but slightly shorter, free from the rachis joint; sessile spikelet 3–4 mm. long; glumes coriaceous, glabrous, the first ovate-oblong, emarginate, the keels narrowly winged, often unequally so; second glume cymbiform, keeled on the back, the keel narrowly winged toward the apex; pediceled spikelets similar to the sessile, usually smaller, rarely as large or reduced to a pair of narrow glumes.

BRITISH NEW GUINEA: Central Division: Budotobara, *Brass* 776 (GH, US) (large savannah grass); Baroka, Nakeo District, alt. 50 m., *Brass* 3702 (GH, US) (scattered amongst the dominant *Anthistiria* [*Themeda*] on savannah forest ridges); Mafulu, alt. 1250 m., *Brass* 5310 (GH, US) (on artificial grasslands); Gosaro, Rigo District, *MacGregor* 19 (US); Western Division: Daru Island, *Brass* 6254 (A, US) (abundant in savannah forest and in some moist shaded situations the dominant grass); Gaima, Lower Fly River, *Brass* 8254 (A, US) (dominant grass on savannah forests); Northern Division: About 9 miles northwest of Oro Bay, *Reeder* 809 (A)<sup>21</sup> (conspicuous constituent of the grassland); Goodenough Island: Haiwali village, *Burcham* 124 (US) (grassy clearing in rain-forest, appears to grow mainly in full sun). NORTHEAST NEW GUINEA: Morobe District: Four miles south of Langemak Bay, near Finschhafen, *Sawyer* 51 (A).

Australia and New Guinea.

### 39. *Thaumastochloa* C. E. Hubb.

*Thaumastochloa* C. E. Hubb., Hook. Ic. 34: pl. 3313, 3314. 1936.

Spikelets awnless, solitary at each node, all facing in the same direction; pediceled spikelets wanting or reduced to a minute glume, the pedicel firmly adnate to the rachis joint and forming with it a semicylindrical internode

<sup>21</sup> This collection consists of a mixture, the specimen at the U. S. National Herbarium being *Ophiurus exaltatus*.



hollowed out within and with the first glume fitting tightly over the hollow containing the spikelet; racemes subcylindric-flattened, terminal, single or fascicled, consisting of 1 or 2 or a greater number of spikelets, these asymmetrical with the tips pointing in opposite directions, the peduncle gradually thickened upward and merging into the lowest rachis joint; first glume coriaceous, smooth or rugose on the back, the margins often inrolled; second glume cymbiform, membranous, 3-5-nerved; lemmas hyaline, the lower epaleate and empty; fertile lemma with a similar narrow palea and a perfect flower. Annuals or perennials with usually short slender somewhat flattened spike-like racemes and slender branching culms.

TYPE SPECIES: *Thaumastochloa pubescens* (Domin) C. E. Hubb. (*Ophiuros pubescens* Domin).

1. *Thaumastochloa rariflora* (F. M. Bailey) C. E. Hubb., Hook. Ic. 34: pl. 3313. 1936; Chase, Jour. Arnold Arb. 20: 314. 1939.

*Rottboellia rariflora* F. M. Bailey, Queensl. Dept. Agric. Bot. Bull. 8: 86. 1893.  
Type from Australia.

Annual; culms slender, geniculately ascending to erect, 10-60 cm. tall, the nodes pubescent to glabrous; sheaths much shorter than the internodes, keeled above, more or less densely pilose, the hairs often papillose-based; ligule membranous, ciliate, about 0.2 mm. long; blades flat or involute in drying, 2-10 cm. long, 2-4 mm. wide; racemes dorsally compressed, bearing one or two spikelets, solitary or fascicled and more or less included in the sheaths; peduncle 0.5-2.5 cm. long, the lower part tapering to a very slender base, becoming curved and readily disarticulating; rachis fragile, disarticulating horizontally, the 1 or 2 rachis joints smooth, glabrous, 2.5-3 mm. long, the upper terminating in a blunt apex scarcely exceeding the spikelet or in an acumen 1-6 mm. long; first glume dorsally flattened to slightly concave, granular-punctate, 9-nerved within, the margins minutely pubescent at the base; second glume 3-5-nerved, the upper margins very minutely ciliate; remainder of the spikelet as in the generic description.

BRITISH NEW GUINEA: Western Division: Wuroi, Oriomo River, alt. 30 m., *Brass 6014* (GH, US) (uncommon on grey soil on savannah ridge); Mabaduan, *Brass 6554* (A, US) (occasional under the dominant *Themedia triandra* in savannah forests).

Australia and New Guinea.

The cited specimens differ from Hubbard's description and illustration, and from the one Australian specimen seen, in having the apex of the upper rachis joint terminating in a blunt point rather than in an acumen 1-6 mm. long. In other respects they seem identical. *Brass 6014* was cited as *Ophiuros pubescens* Domin [*Thaumastochloa pubescens* (Domin) C. E. Hubb.] by Hitchcock (35, p. 128), but in that species the raceme is composed of 4-9 spikelets in which the first glume is dorsally foveolate-tuberculate to transversely rugose.

#### 40. *Ophiuros* Gaertn. f.

*Ophiuros* Gaertn. f., Suppl. Carpol. (Fruct. & Sem. 3) 3. pl. 181, fig. 3. 1805, pro parte.

Spikelets awnless, solitary at each node, distichous, the pediceled spike-

lets wanting, the pedicel firmly adnate to the rachis joint and forming with it a thick semi-cylindrical internode deeply hollowed out within, the first glume fitting tightly over the hollow containing the spikelet; first glume coriaceous, convex on the back and with a small groove at the base just above the narrow circular callus; second glume cymbiform, chartaceous; lemmas hyaline, as long as the spikelet, the first with a well developed palea and usually a staminate flower; fertile lemma with a similar palea and a perfect flower. Tall, coarse perennials with flat blades and smooth slender, spikelike, solitary racemes.

TYPE SPECIES: *Ophiuros corymbosus* (L. f.) Gaertn. f. = *O. exaltatus* (L.) Kuntze (*Aegilops exaltata* L.).

1. *Ophiuros exaltatus* (L.) Kuntze, Rev. Gen. 2: 780. 1891; Hitchc., Brittonia 2: 127. 1936.

*Aegilops exaltata* L., Mant. app. 575. 1771. Type from India.

*Rottboellia corymbosa* L. f., Suppl. Pl. 114. 1781. Type from India.

*Ophiuros corymbosus* (L. f.) Gaertn. f., Suppl. Carpol. (Fruct. & Sem. 3) 3-4. pl. 181, fig. 3B. 1805; Blatter & McCann, Imp. Council Agric. Res. Sci. Monogr. 5: 40. pl. 28. 1935.

Culms glabrous, subrobust, erect from more or less bulbous bases, 1-2 meters tall, with floriferous branches from the upper 2 or 3 nodes; lower sheaths glabrous, the upper often pilose on the margins and more or less dorsally papillose-hispid; blades linear to linear-lanceolate, as much as 60 cm. long, 8-25 mm. wide, rounded or subcordate at base, the margins often papillose-hispid; racemes 6-15 cm. long, about 1.5 mm. in diameter, solitary on slender fascicled branches, these more or less included in the sheaths of the upper leaves; rachis fragile, the joints about 3 mm. long, both ends obliquely truncate, the upper concave, the lower with a small projection which fits into the top of the joint below; first glume ovate-oblong, the dorsal surface smooth or more or less foveolate with 2-4 rows of small depressions, the remainder of the spikelet as in the generic description.

BRITISH NEW GUINEA: Central Division: Rona, Laloki River, alt. 450 m., Brass 3586 (GH, US) (fairly common in *Eucalyptus* savannahs); Baroka, Nakeo District, alt. 50 m., Brass 3724 (GH, US) (common in *Eucalyptus* savannah ridges); Kanosia, alt. about 30 m., Carr 11134 (NY) (open savannah land); Western Division: Wuroi, Oriomo River, alt. 10-30 m., Brass 5735 (GH, US) (scattered on savannah ridges); Mabaduan, Brass 6537 (A, US) (fairly common in grass cover of savannah forests); Lake Daviumbu, Middle Fly River, Brass 7643 (A, US) (open savannah); Northern Division: About 9 miles northwest of Oro Bay, Reeder 809 (US)<sup>22</sup> (common constituent of the grassland). NORTHEAST NEW GUINEA: Morobe District: Markham Valley, Kajabit, Clemens 40838 (US); Finschhafen, Weinland 266 (US).

#### 41. *Sorghum* Moench

*Sorghum* Moench, Meth. Pl. 207. 1794.

*Holcus* L., Sp. Pl. 1047. 1753, pro parte.

Spikelets in pairs or in threes at the ends of the branches, one sessile and fertile, the other pediceled, staminate or neuter, sometimes reduced to a single narrow glume; sessile spikelet dorsally compressed; glumes

<sup>22</sup> This collection consists of a mixture, the specimen at the Arnold Arboretum being *Rottboellia rottboelloides*.

firmly coriaceous, the first rounded on the back or flattened, the margins involute, not keeled; second glume somewhat cymbiform but rounded on the back, not or only slightly keeled; lemmas hyaline or thinly membranous, the lower empty, the upper (fertile) oblong, bifid and awned from the sinus, or entire and awnless. Annuals or perennials with terminal panicles of numerous 1-5-jointed racemes.

TYPE SPECIES: *Sorghum saccharatum* (L.) Moench (*Holcus saccharatus* L. pro parte) = *Sorghum dochna* (Forsk.) Snowden.

#### KEY TO THE SPECIES

1. Panicle branches in whorls; pediceled spikelet staminate; hairs of the inflorescence brown.....1. *S. nitidum*.
1. Panicle branches solitary or in twos or threes; pediceled spikelet reduced to a narrow glume; hairs of the inflorescence white.....2. *S. laxiflorum*.
1. *Sorghum nitidum* (Vahl) Pers., Syn. Pl. 1: 101. 1805; Hitchc., Brittonia 2: 129. 1936.

*Andropogon serratus* Thunb., Fl. Jap. 41. 1784. Type from Japan.

*Holcus nitidus* Vahl, Symb. Bot. 2: 102. 1791. Type from India.

*Holcus fulvus* R. Br., Prodr. Fl. Nov. Holl. 1: 199. 1810. Type from Australia.

*Sorghum fulvum* (R. Br.) Beauv., Ess. Agrost. 164. 1812; White, Proc. Roy. Soc. Queensl. 34: 15. 1923.

*Andropogon tropicus* Spreng., Syst. Veg. 1: 287. 1825; Kunth, Rev. Gram. 1: pl. 97. 1829. Based on *Holcus fulvus* R. Br.

*Sorghum tropicum* (Spreng.) Buse in Miquel, Pl. Jungh. 359. 1854.

*Sorghum serratum* (Thunb.) Kuntze, Rev. Gen. 2: 792. 1891 (non Roem. & Schult. 1817).

Perennial; culms erect or ascending, 60-100 cm. tall, often decumbent, rooting and branching from the lower nodes; nodes densely bearded; sheaths mostly shorter than the internodes, glabrous or sometimes pubescent; ligule membranous, 1.5-2.5 mm. long, ciliolate; blades flat, linear, as much as 50 cm. long, 4-11 mm. wide, glabrous and smooth except for the scabrous margins; panicle oblong, 10-30 cm. long, the slender branches verticillate, naked below, simple and bearing a single terminal raceme (rarely the lower branches once or twice branched); racemes 1-2 cm. long, the rachis joints and pedicels ciliate with brown hairs, the pedicel shorter than the sessile spikelet, the rachis joint from equal to more than twice as long; sessile spikelet ovate to ovate-lanceolate, 3-4 mm. long, brownish or finally shining black, pubescent with brown hairs, awnless or with a twisted and geniculate awn 10-15 mm. long; pediceled spikelets staminate, of about the same size as the sessile, but the glumes membranous or chartaceous and lighter in color.

BRITISH NEW GUINEA: Central Division: Kanosia, Carr 11111 (US) (open savannah land); Carr 11135 (NY) (open savannah land); Roana, Lakoki River, alt. 450 m., Brass 3629 (GH, US) (common species growing sporadically all through the savannahs); Western Division: Wuroi, Oriomo River, Brass 5895 (GH, US) (among *Imperata cylindrica* in savannah forest); Daru Island, Brass 6252 (A, US) (abundant in tall grass ground cover of savannah forest); Lake Daviumbu, Middle Fly River, Brass 7644 (A, US) (occasional in savannahs); Gaima, Lower Fly River, Brass 8263 (A, US) (common in savannah forest grass cover); Tarara, Wassi Kussa River, Brass 8567 (A, US) (savannah forest; associated with *Imperata* on well drained soils); Northern Division: About 9 miles northwest of Oro Bay, Reeder 808 (A, US) (common on grassland); Goodenough



Island: Haiwali village, *Burcham* 121 (US) (grassy clearing in rain-forest). NORTHEAST NEW GUINEA: Morobe District: Kajabit Mission, *Clemens* 10665 (US); Finschhafen, *Weinland* 281 (US). NETHERLANDS NEW GUINEA: West of Hollandia, *Sigafoos* 68 (A); Balim River, alt. 1600 m., *Brass* 11618 (A, US) (one of principal grasses on sandy deforested slopes). NEW BRITAIN: *Parkinson* 45 (US). India to Japan, Malaysia, and Australia.

All the cited specimens except *Brass* 11618 and *Parkinson* 45 are awnless. In the former, only part of the spikelets of the panicle are awned.

2. *Sorghum laxiflorum* F. M. Bailey, Rep. Exped. Bellenden. 70. 1889, Syn. Queensl. Fl. Suppl. 3: 84. 1890, Comp. Cat. Queensl. Pl. 620. fig. 595. 1909. Type from Australia.

*Andropogon Baileyi* F. Muell., Vict. Nat. 8: 16. 1891. Based on *Sorghum laxiflorum* F. M. Bailey.

*Andropogon Sorghum* (L.) Brot. subsp. *halepensis* (L.) Hack. var. *albovillosa* Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 173. 1901. Type from Northeast New Guinea.

Annual; culms weak, freely branching, decumbent below and rooting from the lower nodes, ascending to 1.5 meters, pubescent below the panicle, otherwise glabrous except for the short bearded nodes; sheaths mostly shorter than the internodes, more or less ciliate on the margins, otherwise glabrous; ligule membranous, about 1 mm. long, minutely ciliate; blades linear, rather firm, flat or folded, the margins sometimes revolute, as much as 70 cm. long, 4–10 mm. wide, the apex long-attenuate, glabrous below, the upper surface and margins scabrous to hispid; panicle 15–20 cm. long, the slender lax branches solitary or in twos or threes at the nodes of the axis, bearing 2 to several capillary branchlets each with 1–3 pairs of spikelets toward their tips; rachis joints and pedicels slender, about equal, shorter than the sessile spikelets, white-ciliate on the margins; sessile spikelets about 5 mm. long, narrowly oblong, toward the apex abruptly narrowed into a neck about 1 mm. long; glumes coriaceous, dark brown when mature, the callus and dorsal surface pilose with white hairs; second glume glabrous or only slightly pilose; awn of the fertile lemma 3–4 cm. long, geniculate below the middle, the column dark brown, shining, the margins short-stiff-pubescent with white hairs; pediceled spikelets reduced to one membranous, narrow to subulate glume about 3 mm. long.

BRITISH NEW GUINEA: Northern Division: About 3 miles south of Dobodura, *Reeder* 822 (US) (growing on edge of jungle). NORTHEAST NEW GUINEA: Morobe District: Salamaua, *Clemens* 34 (A) (trail bank, hill near beach); Malshang, near Lae, *Clemens* 10441 (US); Wantoat, *Clemens* 10980, 41090 (US). Australia to New Guinea and the Philippines.

#### 42. *Chrysopogon* Trin.

*Chrysopogon* Trin., Fund. Agrost. 187. 1820. Nom. conserv.

*Rhaphis* Lour., Fl. Cochinch. 2: 552. 1790.

*Pollinia* Spreng., Pl. Pugill. 2: 10. 1815 (non Trin. 1832).

Spikelets mostly in threes at the ends of the panicle branches and branchlets, one sessile and perfect, two pediceled and staminate or neuter, the group falling together, rarely the spikelets in pairs on a 2–4-jointed rachis, but then the spikelets in threes at the ends of the branches; sessile spikelets disarticulating obliquely and forming a more or less elongate sharp-

pointed callus, the callus usually bearded at least on the margins; first glume involute, rounded on the back, keeled upward, the keels usually spiny-hispid; second glume cymbiform, keeled toward the apex and usually aristate; lemmas hyaline, the first 2-nerved, empty; fertile lemma narrow, entire or bidentate, bearing a straight or geniculate awn; pediceled spikelets awnless or with a short straight awn, the glumes of thinner texture than those of the sessile spikelets. Perennials (ours) with terminal strict or rather loose panicles.

TYPE SPECIES: *Chrysopogon Gryllus* (L.) Trin. (*Andropogon Gryllus*, L.).

#### KEY TO THE SPECIES

1. Racemes 2-4-jointed; culms erect, 1-2 meters tall.
  2. Sessile spikelets (including the callus) 5-7 mm. long; callus up to 2 mm. long, white-bearded; racemes longer than the panicle branches. . . . .2. *C. elongatus*.
  2. Sessile spikelets (including the callus) 8-10 mm. long; callus up to 4 mm. long, tawny-bearded; racemes, or many of them, shorter than the panicle branches. . . . .3. *C. filipes*.
1. Racemes reduced to a triad of 1 sessile and 2 pediceled spikelets at the ends of the panicle branches; plants with rhizomes or stolons, the culms ascending to 20-60 cm. . . . .1. *C. aciculatus*.
1. *Chrysopogon aciculatus* (Retz.) Trin., Fund. Agrost. 188. 1820; White, Proc. Roy. Soc. Queensl. 34: 15. 1923.
 

*Andropogon aciculatus* Retz., Obs. Bot. 5: 22. 1789; K. Schum., Bot. Jahrb. 9: 197. 1887. Type from India.

*Rhaphis trivialis* Lour., Fl. Cochinch. 2: 553. 1790; Trin., Sp. Gram. Ic. 1: pl. 8. 1830. Type from Cochinchina.

*Andropogon acicularis* Willd., Sp. Pl. 4: 906. 1806. Based on *A. aciculatus* Retz.

*Rhaphis acicularis* Desv., Opusc. 69. 1831; Hitchc., Mem. Bishop Mus. 8: 219. fig. 107. 1922; Chase, Jour. Arnold Arb. 20: 315. 1939.<sup>23</sup> Based on *A. aciculatus* Retz.

*Rhaphis aciculatus* (Retz.) Honda, Bot. Mag. (Tokyo) 40: 103. 1926; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 153. fig. 82. 1940.

Culms ascending from stout creeping rhizomes and stolons, 20-60 cm. tall; leaves densely imbricate on the rhizomes and stolons, distant on the flowering culms; sheaths terete, glabrous or sparingly bearded at the throat, the margins more or less ciliate, the culm sheaths shorter than the internodes; ligule minutely ciliate; blades flat, rounded at the base, obtuse or subacute at the tips, 2-15 cm. long, 3-5 mm. wide, both sides glabrous or sparsely pilose at the base, the margins sparingly spinulose; panicle long-exserted, linear-oblong, usually purplish, 5-10 cm. long, the filiform branches in whorls of 4-9, about 1 cm. long or less; racemes reduced to a triad of one sessile and two pediceled spikelets; sessile spikelet linear, acuminate from about the middle, about 4 mm. long and with a long sharp rusty-bearded callus 4-6 mm. long, the callus formed by an oblique splitting of the pedicel entirely to the base of the spikelet; first glume spinulose toward the subtruncate or bimucronulate apex; second glume acuminate or aristate, the awn as much as 3 mm. long; fertile lemma entire, with a straight terminal awn 4-7 mm. long; pediceled spikelets 5-6 mm. long, the slender glabrous pedicels 2-3 mm. long.

<sup>23</sup> Hitchcock and Chase give the binomial as "*Rhaphis aciculata* (Retz.) Desv." but Desvaux spelled the specific name "*acicularis*."

BRITISH NEW GUINEA: Central Division: Kanosia, *Carr 11033* (US, NY) (open places); Western Division: Daru Island, *Brass 6426* (A, US) (very troublesome weed on roadsides and town allotments); Northern Division: About 9 miles northwest of Oro Bay, *Reeder 812* (A, US) (frequent in the open in wet places); Goodenough Island: Haiwali village, *Burcham 136* (US) (in vicinity of abandoned native village, mostly about bases of coconuts). NORTHEAST NEW GUINEA: Morobe District: 4 miles south of Langemak Bay, near Finschhafen, *Sawyer 144, 163* (A).

Tropical Asia to Australia, New Guinea, and Polynesia.

2. *Chrysopogon elongatus* (R. Br.) Benth., Fl. Austral. 8: 538. 1878.

*Holcus elongatus* R. Br., Prodr. Fl. Nov. Holl. 1: 200. 1810. Type from Australia.

*Rhaphis elongatus* (R. Br.) Chase, Contr. U. S. Nat. Herb. 24: 205. 1925; Hitchc. Brittonia 2: 129. 1936.

*Vetiveria elongata* (R. Br.) Stapf ex C. E. Hubb., Kew Bull. 1934: 444. 1934.

Culms erect, 1–2.5 meters tall, glabrous, about 7-noded; sheaths mostly longer than the internodes, glabrous or somewhat scabrous; ligule reduced to an even row of short white hairs about 0.2 mm. long; blades long-attenuate, folded for a considerable distance, as much as 50 cm. long, to 8 mm. wide, spinulose-scabrous on the margins and midrib below, otherwise glabrous and smooth, the upper surface with scattered short tubercle-based hairs; panicle pale to purplish, contracted, rather dense, 15–35 cm. long, the branches slender, rather stiff, as much as 4 cm. long; racemes 2–4-jointed, the joints 3–4 mm. long; peduncles 2–3 mm. long; sessile spikelet linear-lanceolate or linear, 5–7 mm. long including the 1.5–2 mm. long callus; the callus bearded on the margin with white or whitish hairs to 3 mm. long; glumes coriaceous, the first acute, spinulose-scabrous on the keels, the second cymbiform, mucronate or aristate with an awn as much as 2 mm. long, keeled upward, the keel spinulose-scabrous; fertile lemma with an awn as much as 12 mm. long, twisted and weakly geniculate below; pediceled spikelets slightly longer than the sessile, the glumes less firm.

BRITISH NEW GUINEA: Western Division: Daru Island, *Brass 6045* (GH, US) (heavy wet soil close behind mangrove fringe), *6283* (A, US) (pure stands on damp soils bordering large swamp); Wassi Kussa River, *Brass 8579* (A, US) (covering small tidal flats at rear of mangrove fringe); *MacGregor 46* (US).

Australia and New Guinea.

*Brass 8579* was reported as *Vetiveria filipes* (Benth.) C. E. Hubb. [*Chrysopogon filipes* (Benth.) Reeder] by Chase (17, p. 315), but that species has longer panicle branches and much larger spikelets.

3. *Chrysopogon filipes* (Benth.) comb. nov.

*Chrysopogon elongatus* (R. Br.) Benth. var. *filipes* Benth., Fl. Austral. 7: 539. 1878. Type from Australia.

*Andropogon elongatus* (R. Br.) Spreng. var. *filipes* (Benth.) Hack. in DC., Monogr. Phan. 6: 565. 1889.

*Vetiveria filipes* (Benth.) C. E. Hubb., Kew Bull. 1934: 444. 1934.

3a. *Chrysopogon filipes* (Benth.) Reeder var. *arundinaceus* var. nov.

A typo culmis altioribus et robustioribus, ramulis paniculorum longioribus, articulibus rhacheis paucioribus, gluma prima valde flava, arista glumae secundae ad 6 mm. longa differt.

Culms robust, erect, 5–8-noded, 1–1.8 meters tall, glabrous or slightly scabrous beneath the panicle; sheaths more or less scabrous on the keel,



those in the middle of the culm slightly shorter than the internodes, the basal sheaths overlapping; ligule a row of even white hairs about 0.2 mm. long; blades as much as 60 cm. long, 5–8 mm. wide, folded at the base, the margins and midnerve more or less spinulose-scabrous; panicle purplish yellow, 20–30 cm. long, contracted or rather loose, the lower branches 6–8 cm. long, flexuous, sometimes bearing 1 or 2 short branchlets; racemes 2–4-jointed, mostly shorter than the panicle branches, the joints slender, 5–15 (rarely to 20) mm. long, the pedicels usually not exceeding the sessile spikelets; sessile spikelets narrowly lanceolate, pale or stramineous, 8–10 mm. long including the sharp 2–4 mm. long callus; the callus bearded on the back and margins with tawny hairs as much as 1.5 mm. long; glumes coriaceous and muricate over the entire dorsal surface, the keels spinulose; first glume narrowly somewhat truncate, often spinulose on the upper half; second glume mucronate or with an awn as much as 6 mm. long; awn on fertile lemma 10–20 mm. long, flexuous, slightly twisted below, not or only slightly geniculate; pediceled spikelets about 6–8 mm. long, lanceolate or more or less subulate.

BRITISH NEW GUINEA: Western Division: Panzara, between Morehead and Wassi Kussa Rivers, *Brass 8460* (A, TYPE, US), December, 1936 (savannah forests, on alluvial flats of creek).

Differs from the species in being much taller and more robust, having longer panicle branches, fewer-jointed racemes, and the glumes of the sessile spikelets yellow below rather than evenly purple throughout, the second glume with an awn as much as 6 mm. long. In some respects it suggests *Vetiveria intermedia* S. T. Blake, but that species has shorter and thicker rachis joints and pedicels, the pediceled spikelets are, on the whole, less developed, and the glumes are merely scabrous or nearly glabrous on the lower half rather than uniformly muricate as in both *C. filipes* and the new variety.

The cited specimen was reported as *Vetiveria filipes* by Chase (17, p. 315).

### 43. *Arthraxon* Beauv.

*Arthraxon* Beauv., *Ess. Agrost.* 111. *pl.* 11, *fig.* 6. 1812.

Spikelets in pairs or solitary, one sessile and perfect, mostly awned, often slightly laterally compressed, at length falling with the appressed rachis joint attached, the other, when present, pediceled, neuter or rarely staminate but usually abortive with only minute pedicels remaining attached to the base of the sessile spikelets; rachis slender, usually tardily disarticulating; first glume rounded on the back, the margins more or less inrolled, usually more or less bristly-hispid on the nerves; second glume keeled, 3-nerved; lower lemma hyaline, short, empty; fertile lemma hyaline or firmer at the base, entire or minutely bidentate, with usually a well developed dorsal awn arising from near the base. Annuals or perennials with flat blades, slender weak culms and digitate or approximate racemes.

TYPE SPECIES: *Arthraxon ciliare* Beauv. = *A. hispidus* (Thunb.) Makino (*Phalaris hispida* Thunb.).

1. *Arthraxon hispidus* (Thunb.) Makino, Bot. Mag. (Tokyo) 26: 214. July, 1912<sup>24</sup>; Hitchc., Brittonia 2: 128. 1936.

*Phalaris hispida* Thunb., Fl. Jap. 44. 1784. Type presumably from Japan.

*Arthraxon ciliare* Beauv., Ess. Agrost. 111, 152. *pl.* 11, *fig.* 6. 1812. No locality given.

*Pollinia ciliaris* (Beauv.) Spreng., Syst. Pl. 1: 289. 1825.

Culms slender, freely branching, ascending from a decumbent base, the nodes bearded; sheaths shorter than the internodes, pubescent on the collar, the margins ciliate; ligule membranous, ciliate, 1–2 mm. long; blades ovate to ovate-lanceolate, 2–5 cm. long, 5–15 mm. wide, glabrous or pubescent, the base cordate-clasping; racemes 2 to many (rarely solitary), 2–4 cm. long; rachis joints slender, glabrous or ciliate, from half to nearly as long as the spikelet; spikelets lanceolate, 3–5 mm. long, first glume rounded on the back, several-nerved, the nerves bristly-hispid; second glume acuminate, equal to or slightly longer than the first, the keel hispid; awn of the fertile lemma usually 5–15 mm. long, geniculate and twisted; sterile pedicel reduced to a minute bristle rarely half as long as the spikelet, often obsolete.

BRITISH NEW GUINEA: Central Division: Urunu, Vanapa Valley, alt. 1900 m., *Brass* 4787 (GH, US) (common on old garden land). NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, alt. 2800 m., *Brass* 10735 (A, US) (on a native clearing in the forest).

Tropical and temperate regions of the Old World.

#### 44. *Andropogon* L.

*Andropogon* L., Sp. Pl. 1045. 1753, Gen. Pl. ed. 5. 468. 1754.

Spikelets in pairs at each node of an articulate rachis, or in threes at the ends of the branches, one sessile and fertile, the other pediceled, staminate or neuter (rarely perfect), sometimes reduced to a single narrow glume; rachis and pedicels of the sterile spikelets slender or sometimes thickened upward, often villous; sessile spikelet dorsally compressed; glumes membranous-coriaceous, awnless, the first rounded, flat or concave dorsally, several-nerved, the median nerve often weak or wanting; second glume cymbiform, keeled; lemmas hyaline, the lower empty; fertile lemma narrow, entire or bifid, usually bearing a slender geniculate and twisted awn, the lemma sometimes reduced to a narrow stipe-like base to the awn; pediceled spikelets awnless (rarely awned), sometimes as large as the sessile and similar to it, but usually more or less reduced. Annuals or perennials of various habitats.

TYPE SPECIES: *Andropogon distachyus* L.

#### KEY TO THE SPECIES AND VARIETIES

1. Racemes solitary on the culms and branches; rachis joints thickened upward with scarious cupular or toothed appendages.
2. Sessile spikelets 2–4 (rarely to 5) mm. long; rachis joints and pedicels glabrous.
3. Sessile spikelets 3–5 mm. long, awned.
  4. Blades 1–4 cm. long, obtuse.....1. *A. brevifolius*.
  4. Blades 5–9 cm. long, tapering to an acute apex.....
  - .....1a. *A. brevifolius* var. *cryptopodus*.

<sup>24</sup> Same combination published by Merrill in Philip. Jour. Sci. Bot. 7: 229. Sept. 1912.

3. Sessile spikelets 2 mm. long, awnless.....1b. *A. brevifolius* var. *paradoxus*.
2. Sessile spikelets 7-8 mm. long; rachis joints and pedicels ciliate...2. *A. sanguineus*.
1. Racemes 2 to several on each peduncle (sometimes solitary in *A. annulatus*).
5. Racemes 1-8-jointed; panicle branches compound, the racemes borne on branchlets of the third or fourth order.
6. Racemes reduced to one sessile and two pediceled spikelets (rarely with one or two pairs of spikelets below); first glume of sessile spikelet prominently concave dorsally.
7. Sessile spikelets awned.....3. *A. micranthus*.
7. Sessile spikelets awnless.....3a. *A. micranthus* var. *muticispiculus*.
6. Racemes 3-8-jointed; first glume of sessile spikelet not prominently concave dorsally.....4. *A. spicigerus*.
5. Racemes 10- or more jointed; panicle branches simple or rarely once branched.
8. Inflorescence paniculate, the axis 4-14 cm. long.....5. *A. intermedius*.
8. Inflorescence digitate or the racemes rarely solitary.
9. First glume long-pilose below the apex and on upper margins, the silky hairs as long as the spikelet or longer, more or less obscuring the spikelets; awn twice-geniculate.....6. *A. sericeus*.
9. First glume more or less pilose and sometimes with long tubercle-based hairs on the upper margins, but the hairs not silky and obscuring the spikelets; awn once-geniculate.....7. *A. annulatus*.
1. *Andropogon brevifolius* Swartz, Prodr. Veg. Ind. Occ. 26. 1788; Kunth, Rev. Gram. 2: *pl.* 196. 1829; Hitchc., Brittonia 2: 128. 1936; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 166. fig. 87. 1940. Type from Jamaica.
- Schizachyrium brevifolium* (Swartz) Nees ex Miquel, Fl. Ind. Bat. 3: 495. 1855.
- Andropogon fragilis* R. Br. var. *malayanus* Merr., Enum. Philip. Fl. Pl. 1: 45. 1923. Type from the Philippines.

Annual; culms delicate, much branched, prostrate, trailing or leaning, more or less compressed, mostly 30-70 cm. long; sheaths glabrous, keeled, mostly shorter than the internodes; ligule very short, membranous, often ciliate; blades flat, obtuse, 1-4 (rarely to 6) cm. long, 2-4 mm. wide, glabrous; racemes solitary, slender, 1-2.5 cm. long, each subtended by a glabrous sheathing spathe; rachis joints clavate, glabrous, shorter and more slender than the sessile spikelets, bidentate at summit; sessile spikelets 3-4 mm. long, the callus very short, white-bearded; first glume dorsally scaberulous, scabrous on the keels, bifid; awn of fertile lemma delicate, geniculate and twisted, as much as 1 cm. long; pediceled spikelets reduced to an awned glume 1-1.5 mm. long, the slender straight awn as much as 5 mm. long; pedicel glabrous, slightly shorter than the sessile spikelet.

BRITISH NEW GUINEA: Western Division: Dagwa, Oriomo River, alt. 40 m., *Brass* 5985 (GH, US) (common on damp flats and ridge slopes); Lake Daviumbu, Middle Fly River, *Brass* 7812 (A, US) (common on sour savannah slopes). NORTHEAST NEW GUINEA: Morobe District: Kajabit, Markham Valley, *Clemens* 10477 (US). NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass* 11723 (A, US) (deforested slopes; locally abundant on sandy soil).

Tropical and temperate regions of both hemispheres.

- 1a. *Andropogon brevifolius* Swartz var. *cryptopodus* (Ohwi) comb. nov.
- Andropogon cryptopodus* Ohwi, Bot. Mag. (Tokyo) 56: 10. 1942. Type from Netherlands New Guinea.

Differs from the species in the more robust habit, longer (5-9 cm.) blades tapering to an acute apex, and slightly larger spikelets.



NETHERLANDS NEW GUINEA: Momi, 60 miles south of Manokwari, alt. 10 m., *Kanehira & Hatusima 13390* (A, TYPE COLL.) (in open grass field along the track to Lake Angi).

Ohwi allies his species to *Andropogon sanguineus*, but it is much more closely related to *A. brevifolius*. The spikelets are almost identical with those of the latter species, although they tend to be slightly larger. The only important differences seem to be the somewhat more robust habit and longer blades, which are acute rather than obtuse.

Ohwi's description and type duplicate agree rather well with the description of *Andropogon brevifolius* var. *fragilis* (R. Br.) Hack. (in DC., Mongr. Phan. 6: 364. 1889). This variety is based on *A. fragilis* R. Br., but Hackel's description does not well agree with the original diagnosis by Brown (11, p. 202), in which the rachis is said to be "sericeo-barbatis." Hackel's description states "racemis gracilibus, articulis glabris." The Kanehira and Hatusima specimen cited above has glabrous rachis joints.

1b. *Andropogon brevifolius* Swartz var. *paradoxus* (Buse) Ohwi, Acta Phytotax. Geobot. 11: 169. 1942.

*Schizachyrium paradoxum* Buse in Miquel, Pl. Jungh. 359. 1854. Type from Sumatra.

*Schizachyrium brevifolium* (Swartz) Nees ex Miquel subsp. *paradoxum* (Buse) Henr., Blumea 1: 308. 1935.

Differs from the species in having awnless sessile spikelets only 2 mm. long; pediceled spikelets 0.5 mm. long, awnless or with an awn about as long as the spikelet.

BRITISH NEW GUINEA: Northern Division: 1 mile north of East Embi Lake, *Reeder 849* (A, US) (forming mats in low wet ground).

Indo-China, Sumatra, Borneo, the Philippines, and New Guinea.

2. *Andropogon sanguineus* (Retz.) Merr., Philip. Jour. Sci. Bot. 12: 101. 1917; Chase, Jour. Arnold Arb. 20: 315. 1939.

*Rottboellia sanguinea* Retz., Obs. Bot. 3: 25 [error for 13]. 1783. Type from China.

*Andropogon pseudograya* Steud., Syn. Pl. Glum. 1: 365. 1854; Hack. in DC., Monogr. Phan. 6: 370. 1889. Type from Ceylon.

*Schizachyrium sanguineum* (Retz.) Alston, Suppl. Fl. Ceylon 6: 334. 1931.

Culms usually tufted, erect, rather slender, 50–100 cm. tall, freely branching above, the branches appressed to the flat side of the culm; sheaths keeled, glabrous and smooth; ligule membranous, about 1.5 mm. long; blades flat, 5–20 cm. long, 1–5 mm. wide, glabrous, the margins and midrib below scabrous; racemes solitary, slender, 5–7 cm. long, shortly exserted or the lower part included in the narrow spathe; rachis joints rather slender, dilated upward, slightly shorter than the sessile spikelets, glabrous or sometimes ciliate along the outer or both margins, the base bearded with white hairs 1–2 mm. long; sessile spikelets 7–8 mm. long, narrowly linear, the first glume glabrous, tuberculate-scabrous; awn of fertile lemma up to 15 mm. long, geniculate and twisted below; pediceled spikelets reduced, about 3 mm. long, awned, the awn slender, straight, about as long as the spikelet; pedicels about as long as the rachis joints or slightly shorter, ciliate on the margins, the hairs increasing in length upward.

BRITISH NEW GUINEA: Western Division: Lake Daviumbu, Middle Fly River, *Brass 7933* (A, US) (occasional on sour savannah slopes).

India to South China, Malaysia, and New Guinea.

3. *Andropogon micranthus* Kunth, Rev. Gram. 1: 165, 1829; Hitchc., Brittonia 2: 128, 1936. Based on *Holcus parviflorus* R. Br.

*Holcus parviflorus* R. Br., Prodr. Fl. Nov. Holl. 1: 199, 1810. Type from Australia.

*Andropogon parviflorus* (R. Br.) Domin, Bibl. Bot. 85: 263, 1915 (non Roxb. 1820).

*Capillipedium parviflorum* (R. Br.) Stapf in Prain, Fl. Trop. Afr. 9: 169, 1917.

Perennial; culms tufted, slender, up to 1 meter or more tall, erect or ascending, simple or sparingly branched, glabrous or appressed-pubescent, especially near the nodes; nodes short-bearded; sheaths mostly shorter than the internodes, glabrous or more or less papillose-pubescent, the margins ciliate, the collar often villous; ligule very short, truncate, ciliolate; blades flat or the margins revolute, as much as 30 cm. long, 2–6 mm. wide, rather firm, the margins and upper surface scabrous, smooth to scaberulous beneath, glabrous or puberulent, often with a few long tubercle-based hairs on the upper surface near the ligule; panicle 8–25 cm. long, the branches and branchlets very slender, pubescent in their axils, otherwise usually glabrous, sometimes puberulent throughout; racemes borne on branches of the third and fourth order, 1-jointed, reduced to 1 sessile and 2 pediceled spikelets (rarely 2 or more jointed and with one or more pairs of spikelets below); sessile spikelets narrowly oblong to elliptic, 2.5–3 mm. long, the callus short-bearded; first glume hispidulous, shallowly concave on the back; fertile lemma narrow, awned, the awn geniculate, twisted, 11–16 mm. long; pediceled spikelets awnless, usually staminate (rarely neuter), similar to the sessile spikelet or more or less reduced.

BRITISH NEW GUINEA: Central Division: Rona, Laloki River, alt. 450 m., *Brass* 3558 (A, US) (common on savannah hillsides); Urunu, Vanapa Valley, alt. 1900 m., *Brass* 4799 (GH, US) (common on open grasslands); ? Division: "Barowara," *MacGregor* 10 (US); Quaipo, *MacGregor* 20 (US). NORTHEAST NEW GUINEA: Morobe District: Wau, *Clemens* 10458 (US) (steep grasslands above gold fields); Kajabit, Markham Valley, *Clemens* 10451bis (US) (grassland). NEW BRITAIN: Cape Gloucester, *Burcham* 141 (US) (in open grassland).

Tropical and subtropical regions of the Old World.

*MacGregor* 20 has some of the racemes 3- or 4-jointed and is, in this respect, like *Andropogon spicigerus*. The first glume of the sessile spikelet, however, is rather prominently concave dorsally and has only 2 or 3 intercarinal nerves, characters which would place this specimen in *A. micranthus*.

- 3a. *Andropogon micranthus* Kunth. var. *muticispiculus* (Ohwi) comb. nov.

*Bothriochloa parviflora* (R. Br.) Ohwi var. *muticispicula* Ohwi, Tokyo Sci. Mus. Bull. 18: 13, 1947.

BRITISH NEW GUINEA: Central Division: Kanosia, *Carr* 11106, 11309 (NY) (open savannah land); Northern Division: South of Dobodura, *Reeder* 801 (A, US) (common in open grassland); about 9 miles northwest of Oro Bay, *Reeder* 810 (A, US) (in dense grassland; panicles open); Without precise locality: *MacGregor* 52 (US). NORTHEAST NEW GUINEA: Morobe District: Kajabit, Markham Valley, *Clemens* 10541 (US) (grassland); Ramu Valley, near the headwaters of the Markham River, *Rogers* 3003 (A).

This variety appears to differ from the species in no other particular except the absence of an awn on the perfect spikelet. Examination of the extensive collections of this species in the U. S. National Herbarium

reveals no awnless specimens except those from New Guinea. The two forms apparently grow side by side, as one of the collections (*Clemens 10541*) consisted of a mixture of awned and awnless plants.

4. *Andropogon spicigerus* (S. T. Blake) comb. nov.

*Capillipedium spicigerum* S. T. Blake<sup>25</sup>, Queensl. Univ. Dept. Biol. Papers 2: 43. 1944. Type from Australia.

Culms 90–120 cm. tall, slender to subrobust, erect or somewhat geniculate at base, simple or sparsely branching, glabrous or sometimes appressed-pilose, often pruinose below the nodes; sheaths terete or somewhat keeled above, glabrous to more or less papillose-hirsute; ligule truncate, ciliate, about 0.75 mm. long; blades linear, flat or the margins revolute, as much as 40 cm. long, 5–10 mm. wide, narrowed toward the base, the apex long-attenuate, scaberulous above, glabrous beneath, the margins scabrous, the upper surface often pilose toward the base, otherwise glabrous; panicle ovate to lanceolate, purplish or rarely pale, 10–20 cm. long, the branches and branchlets slender, pubescent in their axils, otherwise glabrous or sometimes sparsely puberulent; racemes 3–8 (ours mostly 4–5)-jointed, borne on branches of the third or fourth order; joints and pedicels subequal, half to two-thirds as long as the sessile spikelets, ciliate on one or both sides; sessile spikelet oblong-lanceolate, acutish, the callus short-bearded; first glume 6–9-nerved (2–5 intercarinal nerves), dorsally more or less stiff-puberulent and slightly depressed, the keels shortly pectinate on the upper half; second glume scabrous on the keel or nearly smooth; sterile lemma hyaline, half to two-thirds as long as the glumes; fertile lemma narrow, awned, the slender awn 12–18 mm. long, geniculate and twisted below the bend; pediceled spikelets awnless, staminate or neuter, shorter and narrower than the fertile or sometimes nearly as long (in our specimens mostly neuter and reduced to small lanceolate glumes half to two-thirds as long as the sessile spikelets).

NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass 11616, 11805, 11845* (A, US) (common on deforested slopes).

Australia and New Guinea.

Closely related to *Andropogon micranthus* but differing in the 3–8-jointed racemes, sessile spikelet with the first glume less concave on the back and often with 4 or 5 intercarinal nerves, and the more robust habit. Blake (7, p. 45) states that there are always 4 or 5 intercarinal nerves, but our specimens, which agree well with the original description and with a type duplicate (at US) in other respects, often have only 2 or 3 intercarinal nerves; however, some of the sessile spikelets on these plants have 4 or 5 intercarinal nerves on the first glumes in the same inflorescence. The actual spikelet differences between this species and *A. micranthus* appear very slight, but the plants have a rather distinct appearance and the 3–8-jointed raceme seems quite constant. Perhaps the species would be better treated as a variety, but for the present it seems preferable to retain it as a species pending further study of collections from other parts of its range.

<sup>25</sup> Although Blake uses the same epithet, this is not a new combination based on *Chrysopogon parviflorus* (R. Br.) Benth. var. *spicigera* Benth. (Fl. Austral. 7: 538. 1878), but a new species based on a new type. For a detailed discussion see Blake (7, p. 43–46. 1944).



The cited specimens were all reported as *Andropogon intermedius* R. Br. by Chase (18, p. 89).

5. *Andropogon intermedius* R. Br., Prodr. Fl. Nov. Holl. 1: 202. 1810. Type from Australia.

*Bothriochloa intermedia* (R. Br.) A. Camus, Ann. Soc. Linn. Lyon II. 76: 164. 1931.

Perennial; culms tufted, 50–100 cm. or more tall, erect or geniculate at base, simple or sparingly branched, glabrous, the nodes sometimes short-bearded; sheaths glabrous, terete or slightly keeled upward, mostly shorter than the internodes; ligule very short, truncate; blades flat or revolute, 10–30 cm. long, 3–6 mm. wide, smooth or scaberulous, the margins scabrous; panicle 6–15 cm. long, open, loose to somewhat dense, the axis 3–14 cm. long; branches slender, solitary or in pairs, the lower sometimes in fours, usually simple but sometimes branched, often bearded in the axils, otherwise glabrous; racemes slender, 2–5 cm. long, 10- or more jointed; joints and pedicels ciliate, the hairs up to 2.5 mm. long; sessile spikelet elliptic-oblong, obtuse, 3–4 mm. long, the callus short-bearded; first glume with 5–7 intercarinal nerves, pectinate on the upper part of the keels, dorsally depressed or sometimes with a circular pit, more or less pubescent on the lower half; awn of the narrow fertile lemma slender, 10 mm. or more long, geniculate and twisted below the bend; pediceled spikelets awnless, staminate or neuter, about as long as the sessile and similar to it but narrower.

BRITISH NEW GUINEA: Central Division: Kanosia, Carr 11329 (NY) (open savannah land).

China to Malaysia, Australia, and New Guinea.

6. *Andropogon sericeus* R. Br., Prodr. Fl. Nov. Holl. 1: 201. 1810; Bailey, Queensl. Agric. Jour. 7(4): 350. 1900; White, Proc. Roy. Soc. Queensl. 34: 15. 1923. Type from Australia.

*Dicanthium sericeum* (R. Br.) A. Camus, Bull. Mus. Hist. Nat. (Paris) 27: 549. 1921.

Perennial; culms densely tufted, erect, subrobust, 40–100 cm. tall, simple or with few to several floriferous branches from the upper nodes, often pruinose; nodes stellate-bearded; sheaths glabrous, keeled above, mostly shorter than the internodes, often pruinose like the culms; ligule membranous, ciliolate, 1–1.5 mm. long; blades flat or revolute, rigid, 10–25 cm. long, 2–5 mm. wide, glabrous below, the upper surface and margins scabrous; racemes 2–7, digitate, 2.5–5 cm. long, silky-villous; rachis joints and pedicels slender, the pedicels about half as long as the sessile spikelets, the joints slightly shorter, both ciliate, the hairs increasing in length upward; sessile spikelet oblong to ovate-oblong, about 4 mm. long; first glume obtuse, 7-nerved, pubescent on the lower half, papillose-pilose below the apex and along the margin on the upper half, the hairs equaling the spikelet or longer; awn 20–25 mm. long, twice geniculate; pediceled spikelets similar to the sessile, but awnless.

Australia.

No specimens of this species from New Guinea were seen, but it is included here since it has been reported several times. The description was based on Australian specimens.

7. *Andropogon annulatus* Forsk., Fl. Aegypt. Arab. 173. 1775; White, Proc. Roy. Soc. Queensl. 34: 15. 1923. Type from the banks of the Nile.

*Dichanthium annulatum* (Forsk.) Stapf in Prain, Fl. Trop. Afr. 9: 178. 1917.

Perennial; culms slender, densely tufted, erect or geniculately ascending, 50–100 cm. tall, glabrous except for the short-bearded nodes; sheaths glabrous, distinctly shorter than the internodes, slightly keeled above; ligule membranous, ciliolate, 0.5–1.5 mm. long; blades narrowly linear, 5–15 cm. long, 1.5–3 mm. wide, flat or revolute, the margins and lower surface scaberulous, the upper surface often sparsely pilose with tubercle-based hairs; racemes 1–5, digitate, 2–5 cm. long, spikelet-bearing to the base; rachis joints and pedicels subequal or the joints shorter, slender, about half as long as the sessile spikelets or shorter, ciliate, the hairs increasing in length upward; sessile spikelet oblong-elliptic, obtuse, about 4 mm. long; first glume prominently nerved, more or less pilose, sometimes with long tubercle-based hairs especially near the margins above; awns slender, 15–20 mm. long, geniculate and twisted below the bend; pediceled spikelets similar to the sessile but awnless.

BRITISH NEW GUINEA: Central Division: Port Moresby, *Brass* 8787 (A, US) (common on roadsides); Western Division: Daru Island, *Brass* 6404 (A, US) (growing about the wharf, apparently of recent introduction).

Africa to India, China, Australia, and New Guinea.

The cited specimens were reported as *Andropogon annulatus* var. *monostachys* F. Muell. ex Benth., by Chase (17, p. 315), but examination of a type fragment (at A) reveals that this variety has much larger spikelets and the racemes are stouter. This form has been described as a species under the genus *Dichanthium* (*D. fecundum*) by S. T. Blake (7, p. 51. 1944). In his discussion under this species, Blake states (op. cit. p. 54) that the pediceled spikelets usually are perfect and contain a well developed pistil. The pistil produces a grain and seems to be equally fertile to that of the sessile spikelet. These pediceled spikelets commonly have also a well developed geniculate and twisted awn, he states. Blake's new species is apparently confined to Australia.

#### 45. *Cymbopogon* Spreng.

*Cymbopogon* Spreng., Pl. Pugill. 2: 14. 1815.

Racemes in pairs, one sessile, the other short-peduncled, included in an inflated spathe, the spathes in a large compound inflorescence; spikelets paired as in *Andropogon*, but the lower pair, in one or both racemes, homogamous (both awnless, staminate or neuter), otherwise the sessile spikelet perfect, usually awned, the pediceled spikelet staminate, awnless; rachis fragile, the joints falling attached to the sessile spikelet, the callus short, blunt; sessile spikelet more or less dorsally compressed; glumes membranous-chartaceous, the first flat or rounded on the back, rather prominently two-keeled, the margins inflexed; second glume wing-keeled toward the apex; lemmas hyaline or the lower thinly membranous, the fertile bearing a twisted geniculate awn with a glabrous column (rarely awnless). Robust often aromatic perennials with simple culms below the spathaceous inflorescences. This genus includes the oil grasses of commerce.

TYPE SPECIES: *Cymbopogon Schoenanthus* (L.) Spreng. (*Andropogon Schoenanthus* L.).

1. *Cymbopogon procerus* (R. Br.) Domin, Bibl. Bot. 85: 273. 1915; Hitchc., Brittonia 2: 128. 1936.

*Andropogon procerus* R. Br., Prodr. Fl. Nov. Holl. 1: 202. 1810. Type from Australia.

Culms erect, 1–2.5 meters tall, glabrous or sometimes more or less pubescent below the nodes; sheaths glabrous, shorter than the internodes; ligule membranous, 3–4 mm. long, more or less erose or ciliate at summit; blades as much as 90 cm. long, 5–20 mm. wide, attenuate at the base, usually somewhat involute, glabrous on both surfaces, the margins scabrous; panicle 15–30 cm. long, narrow, dense, with numerous short branches, the acuminate cymbiform spathes about equal to or longer than the 1.5–2 cm. long racemes; rachis joints and pedicels equal, rather slender, about half as long as the sessile spikelet, clothed with spreading silky hairs, those on the upper part up to 3 mm. long; lowermost pair of spikelets on the sessile raceme homogamous, awnless, reduced to a many-nerved first glume 3–4 mm. long or sometimes with a short second glume enclosed, the pediceled spikelets throughout the inflorescence of the same nature; sessile spikelet about 4 mm. long including the short-bearded callus; first glume lanceolate, 5–6-nerved, the nerves prominent above, becoming obscure toward the base, the keels narrowly winged toward the obtuse or bifid apex; second glume cymbiform, equal to the first, about 5-nerved, narrowly wing-keeled toward the summit, the margins ciliate; lemmas subequal, about one-fourth shorter than the glumes, the lower empty, thinly membranous, the margins ciliate; fertile lemma hyaline, cleft to the middle and bearing a twisted and geniculate awn from the base of the cleft, the awn about 12 mm. long, the brownish column about 5 mm. long.

BRITISH NEW GUINEA: Central Division: Baroka, Nakeo District, alt. 50 m., *Brass* 3713 (GH, US) (small scattered tufts); Western Division: Wuroi, Oriomo River, alt. 10–30 m., *Brass* 5725 (GH, US) (on savannah at about its junction with the rain-forest); Daru Island, *Brass* 6364 (A, US) (uncommon on drier soils of savannah forests); Gaima, Lower Fly River, *Brass* 8370 (A, US) (clumps in denser savannah forest).

Australia and New Guinea.

The cited specimens agree with the short original description, and, in general, with the more detailed description by Hackel (23, p. 94). While Hackel states that there are no nerves between the keels on the first glume, the New Guinea specimens have 3 or 4 nerves which are rather prominent above and obscure below, and the keels are very narrowly winged. The specimen cited as *Andropogon Nardus* L. var. *grandis* Hack. by C. T. White (75, p. 15) may be this species.

*Cymbopogon flexuosus* (Nees ex Steud.) Stapf, Kew Bull. 1906: 319. 1906.

*Andropogon flexuosus* Nees ex Steud., Syn. Pl. Glum. 1: 388. 1854. Type from India.

*Andropogon Nardus* L. var. *flexuosus* (Nees ex Steud.) Hack. in DC., Monogr. Phan. 6: 603. 1889; K. Schum., Notizbl. Bot. Gart. Berlin 2: 91. 1898; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 173. 1901.

This is one of the Citronella or Lemon Grasses. It has been cultivated by the colonists and by the natives of New Britain, according to the above



reports. This species is characterized by its large, loose, greyish or slate colored panicles with very slender long flexuous and often drooping branches and usually very slender acute spikelets. No specimens from this region have been seen.

#### 46. *Hyparrhenia* Anderss.

*Hyparrhenia* Anderss., Nova Acta Soc. Sci. Upsal. III. 2: 231, 244, 254. 1856, nomen; in Schweinf., Beitr. Fl. Aethiop. 300. 1867, nomen; Fourn., Mex. Pl. 2: 51, 67. 1886, sine descr.; Stapf in Prain, Fl. Trop. Afr. 9: 291. 1918, descr.

Racemes in pairs, one sessile, the other short-peduncled, subtended by a narrow sheathing spathe, the spathes in a large compound inflorescence: spikelets paired, the lowest pair in one or both racemes homogamous, staminate or neuter as in *Cymbopogon*, but the sessile perfect spikelet disarticulating obliquely, leaving a sharp-pointed callus and the awn of the fertile lemma hirtellous below the bend; glumes membranous-chartaceous, the first sometimes dorsally grooved, with inflexed margins, but the edges rounded, not sharply keeled; second glume cymbiform, rounded below, somewhat keeled toward the summit; pediceled spikelets often with the first glume short-awned. Perennials, not aromatic, with compound spatheate panicles.

TYPE SPECIES: *Hyparrhenia pseudocymbaria* (Steud.) Stapf.

1. *Hyparrhenia bracteata* (Humb. & Bonpl. ex Willd.) Stapf in Prain, Fl. Trop. Afr. 9: 360. 1918; Hitchc., Brittonia 2: 128. 1936; Pilger, Nat. Pflanzenfam. ed. 2. 143: fig. 94. 1940.

*Andropogon bracteatus* Humb. & Bonpl. ex Willd., Sp. Pl. 4: 914. 1806. Type from Cumana [Venezuela].

*Cymbopogon bracteatus* (Humb. & Bonpl. ex Willd.) Hitchc., Contr. U. S. Nat. Herb. 17: 209. 1913.

Culms erect, tufted, 60–200 cm. tall; sheaths hirsute or the upper glabrous, the basal densely villous; ligule membranous, about 2–3 mm. long, ciliate or often erose; blades linear, as much as 60 cm. long, 3–6 mm. wide, flat or more or less convolute, glabrous above, the lower surface more or less pubescent; panicle narrow, 20–40 cm. long; spathes 2–4 cm. long, reddish brown, glabrous or nearly so; racemes about 1 cm. long, the common peduncle slender, exerted from the side of the spathe, clothed with yellow spreading papillose-based hairs, the racemes finally divergent or reflexed, one of them sessile with a pair of homogamous sterile awnless spikelets at base and above them one perfect sessile long-awned spikelet and two sterile awnless pediceled spikelets, the other raceme similar but short-peduncled and without the pair of homogamous spikelets at base; perfect spikelet 6–7 mm. long including the sharp-pointed callus, dorsally glabrous, the callus and slender pedicels clothed with short white hairs, the awn of the fertile lemma 2.5–4 mm. long, geniculate in the middle, the column hirtellous; sterile spikelets similar but the first glume with a short straight awn 1–2 mm. long.

BRITISH NEW GUINEA: Central Division: Urunu, Vanapa Valley, alt. 1500 m., Brass 4817 (A, US) (one of the commonest of open grassland species).

Tropical America, tropical Africa, Indo-China, China, and New Guinea.

The cited specimens are overmature and most of the spikelets have fallen. They are, however, complete enough for fairly accurate compari-

son and seem to be identical with plants of this species from China. They are slightly smaller than the South American plants and have glabrous rather than appressed-hirsute spathes.

#### 47. *Themeda* Forsk.

*Themeda* Forsk., Fl. Aegypt. Arab. 178. 1775.

Spikelets in pairs, or in threes in the terminal rachis joints, the lowermost two pairs of the raceme homogamous, staminate or neuter, awnless, closely approximate and appearing verticillate or like an involucre, the remaining 1-3 pairs heterogamous, one sessile and perfect, the other pediceled, staminate or neuter; fertile spikelets terete, usually awned (rarely awnless), obliquely disarticulating with a sharp rufous-bearded callus; racemes solitary in each proper spathe, these aggregated in flabellate clusters or solitary in the axils. Perennials or annuals with compound or simple spatheate panicles.

TYPE SPECIES: *Themeda triandra* Forsk.

#### KEY TO THE SPECIES AND VARIETIES

1. Involucral spikelets sterile, reduced to a single thin, membranous glume; plants annual.....1. *T. frondosa*.
1. Involucral spikelets with two well developed glumes, often staminate; plants perennial.
  2. Involucral spikelets borne at the same level; culms slender; midrib of blades thin, fine.....2. *T. triandra*.
  2. Involucral spikelets borne at different levels; culms robust; midrib of blades broad, conspicuous.
    3. Involucral spikelets clothed with golden or brown tubercle-based hairs; fertile spikelets awnless or with a short straight awn 10 mm. long or less.
      4. Involucral spikelets 6.5-8 mm. long; fertile spikelets 6.5-7 mm. long including the callus; first glume sparsely puberulent, prominently 5-7-nerved....3. *T. gigantea*.
      4. Involucral spikelets 10-13 mm. long; fertile spikelets 9-10 mm. long including the callus; the first glume densely puberulent with golden or brownish hairs.....3a. *T. gigantea* var. *amboinensis*.
    3. Involucral spikelets glabrous or scaberulous; fertile spikelets awned, the awn 2.5-3 cm. long, geniculate and twisted....3b. *T. gigantea* var. *novoguineensis*.
1. *Themeda frondosa* (R. Br.) Merr., Bur. Sci. Publ. Manila 9: 89. 1917; Chase, Jour. Arnold Arb. 20: 316. 1939.  
*Anthisteria frondosa* R. Br., Prodr. Fl. Nov. Holl. 1: 200. 1810. Type from Australia.  
*Themeda arguens* sensu Hack. in DC., Monogr. Phan. 6: 657. 1889 (non *Stipa arguens* L.).

Annual; culms erect to geniculately ascending, more or less compressed, often rooting from the lower nodes, 60-120 cm. tall (to 3 meters fide Hackel); sheaths keeled, much shorter than the internodes, glabrous to more or less papillose-hirsute; ligule membranous, 1-2 mm. long, rounded-truncate; blades flat, 10-40 cm. long, 4-6 mm. wide, glabrous to more or less pilose above toward the base, smooth below, the upper surface and margins scaberulous to scabrous; panicle one-third to half the length of the plant, strongly interrupted, composed of 2 or 3 remote nodes, the branches solitary to binate and bearing numerous fascicled branchlets,

these capitate, each head bearing 6–20 fertile racemes and often several sterile ones; proper spathes 3.5–4 cm. long, long-attenuate, glabrous to more or less papillose-pilose toward the base; racemes about 1.5 cm. long, bearing 1 fertile spikelet; involucre spikelets 8–10 mm. long, reduced to one thin membranous glume, this acute, bi- or tricuspidate, 5–7-nerved, one or both margins broadly scarious-winged; perfect spikelets 8–10 mm. long, including the 3–4 mm. long callus; the callus sharp-pointed, curved, glabrous dorsally, the sides and ventral part densely bearded, the hairs at first golden, becoming brown when mature, extending to about the middle of the spikelet; glumes hispid to tuberculate-scarious above, smooth below; awn stout, 7–9 cm. long, geniculate and twisted, puberulent below the bend.

BRITISH NEW GUINEA: Western Division: Mabaduan, *Brass* 6474 (A, US) (locally abundant on sandy soil in savannah forests).

Philippines to Malaysia, Australia, and New Guinea.

2. *Themeda triandra* Forsk., *Fl. Aegypt. Arab.* 178. 1775; K. Schum. & Lauterb., *Fl. Deutsch. Schutzgeb. Südsee* 173. 1901; C. E. Hubb., *East. Afr. Pasture Pl.* 28. fig. 15. 1926; Blatter & McCann, *Imp. Council Agric. Res. Sci. Monogr.* 5: 115. pl. 74. 1935; Pilger, *Nat. Pflanzenfam.* ed. 2. 14e: 179. fig. 95. 1940. Type from Arabia.

*Anthistiria imberbis* Retz., *Obs. Bot.* 3<sup>1</sup>, 11. 1783; C. T. White, *Proc. Roy. Soc. Queensl.* 34: 15. 1923. No locality is given.

*Anthistiria australis* R. Br., *Prodr. Fl. Nov. Holl.* 1: 200. 1810; K. Schum., *Bot. Jahrb.* 9: 197. 1889. Type from Australia.

*Anthistiria Forskalii* Kunth, *Rev. Gram.* 1: 162. 1829.<sup>26</sup>

*Anthistiria vulgaris* Hack., *Nat. Pflanzenfam.* II. 2: 29. fig. 20. 1887<sup>27</sup>; K. Schum. & Hollr., *Fl. Kais. Wilhelmsland* 22. 1889.

*Themeda Forskalii* (Kunth) Hack. in DC., *Monogr. Phan.* 6: 659. 1889, *Bot. Jahrb.* 13: 261. 1890.

*Themeda australis* (R. Br.) Stapf in Prain, *Fl. Trop. Afr.* 9: 420. 1919.

Perennial; culms rather slender, erect or geniculately ascending, terete or subcompressed, glabrous, often pruinose below the nodes; sheaths overlapping below, shorter than the internodes in the upper part of the culm, keeled, glabrous or more or less papillose-hispid or pilose; ligule membranous, ciliate, 1–1.75 mm. long, rounded-truncate; blades with a thin fine midrib, linear, 10–40 cm. long, 2–7 mm. wide, usually glabrous beneath, the margins and upper surface often papillose-pilose; panicle narrow, one-fourth to one-third the length of the plant; racemes 12–18 mm. long on peduncles 1–5 mm. long; the involucre spikelets borne at the same level, glabrous or with scattered stiff tubercle-based hairs; fertile spikelets 6–9 mm. long including the brown hairy callus, dorsally glabrous, hispidulous toward the apex; awns 3–6 mm. long, twisted and geniculate, the column puberulent.

<sup>26</sup> Kunth gives as the basis of this name *Themeda polygama* Forsk., but there is no *T. polygama* in Forskal's work. There is a *T. polygama* Gmel. (*Syst. Nat.* 2: 149. 1791) in which the reference is: "Forsk. *Fl. aeg. arab.* p. 178." The only species of *Themeda* in that work is *T. triandra* Forsk.

<sup>27</sup> Hackel gives no description, but there is an excellent plate. He states: "*A. ciliata* der Autoren, nicht *L. fil.*" The distribution is given as from Syria to Algeria to Capeland and Tasmania, the "Kangaroo Grass" of the Australian farmer. In DC., *Monogr. Phan.* 6: 659. 1889, Hackel reduces this species to *Themeda Forskalii* (Kunth) Hack. = *T. triandra* Forsk.



BRITISH NEW GUINEA: Central Division: Budotobara, alt. about 100 m., *Brass* 765 (GH, US) (a dominant species on dry savannahs); Rona, Laloki River, alt. 450 m., *Brass* 3692 (A, US) (common savannah grass); Baroka, Nakeo District, alt. 50-100 m., *Brass* 3723 (the dominant grass on higher ridges in this locality); Kanosia, Carr 11133 (NY) (open savannah land); Northern Division: About 9 miles northwest of Oro Bay, Reeder 803 (A, US) (bunchgrass, common in grasslands); Western Division: Wuroi, Oriomo River, alt. 10-30 m., *Brass* 5873 (rare, scattered on banks of a savannah stream); Dagwa, Oriomo River, alt. 40 m., *Brass* 5927 (A, US) (the dominant species on large areas of open ridges); Daru Island, *Brass* 6269 (A, US) (dominant grass over most of savannah forest). NORTHEAST NEW GUINEA: Morobe District: Ramu Valley, near the headwaters of the Markham River, Rogers 3004 (A). NETHERLANDS NEW GUINEA: West of Hollandia, *Sigafoos* 28 (A). SOLOMON ISLANDS: Guadalcanal: Berande, *Brass* 2551 (GH) (the principal species on the extensive grassy slopes peculiar to the west side of the Island); Florida: *Brass* 3241 (GH) (stony hillsides, common, grows in tussocks).

Widely distributed in tropical and temperate regions of the Old World.

3. *Themeda gigantea* (Cav.) Hack. in DC., Monogr. Phan. 6: 670. 1889; K. Schum., Notizbl. Bot. Gart. Berlin 2: 92. 1898.

*Anthistiria gigantea* Cav., Ic. Pl. 5: 36. pl. 458. 1799; F. Muell., Pap. Pl. 2: 51. 1886. Type from the Philippines.

Perennial; culms caespitose, erect, 1.5-4 meters tall, robust, glabrous, terete or subcompressed, unbranched below the inflorescence, often pruinose below the nodes; sheaths shorter than the internodes, compressed, keeled, glabrous or somewhat pubescent on the upper margins; ligule short, truncate to rounded, membranous, ciliate; blades lanceolate-linear to narrowly linear, 30-100 cm. long, 5-25 mm. wide, flat or canaliculate, rigid, erect, scabrous above, often glaucous below, the margins serrulate-scabrous, the midrib broad, prominent; panicle ample, as much as 1 meter or more long; spathes 1-1.2 cm. long; racemes divergent, about 1 cm. long, borne on peduncles 1-2 mm. long; involucre spikelets 6.5-8 mm. long, borne at different levels, the first glume clothed with golden or brownish tubercle-based hairs; perfect spikelets awnless, usually solitary in each raceme, 6.5-7 mm. long including the 1.5 mm. long callus, sparsely puberulent, the first glume distinctly 5-7-nerved.

SOLOMON ISLANDS: Florida: N'Gela, *Brass* 3518 (GH) (growing here and there along the foreshores; very tall, coarse tussock grass).

A wide ranging polymorphic species. The above description applies to Hackel's subsp. *genuina* var. *genuina*.

- 3a. *Themeda gigantea* (Cav.) Hack. var. *amboinensis* Hack. in DC., Monogr. Phan. 6: 673. 1889.

Racemes 1.5-2 cm. long; peduncles 5-7 mm. long, pilose with yellowish or brownish hairs at least on the upper half; spathes glabrous, 2-3.5 cm. long; involucre spikelets 10-13 mm. long, the first glume clothed with yellowish to brownish tubercle-based hairs; perfect spikelets densely puberulent with golden or brownish hairs, 9-10 mm. long including the 2 mm. long callus, 1 or 2 in each raceme, awnless or with a short straight awn as much as 10 mm. long.

BRITISH NEW GUINEA: Central Division: Bisiatabu, alt. about 470 m., *Brass* 634 (A, US) (tall coarse grass 6-8 ft. high on dry savannahs); Gulf Division: Kerema, *Brass* 1205 (GH, US) (open grassland near the coast); Western Division: Daru Island, *Brass* 6382 (A, US) (about edges of rain forest second

growths, not common; in clumps about 3 meters high); Lake Daviumbu, Middle Fly River, *Brass* 7768 (A) (a solitary specimen in an overgrown garden clearing). NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass* 11678 (A, US) (plentiful along old dykes and other well drained situations on river plain; clumps up to 3 meters high). NEW BRITAIN: *R. Parkinson* 64 (US). SOLOMON ISLANDS: San Cristoval: Waimamura, *Brass* 2857, 3126 (GH) (small area of natural grassland; rare; tall robust species).

Netherlands Indies to New Guinea.

Distinguished from the species by the longer spathes, longer peduncles, larger involuclral spikelets, and the larger perfect spikelets, which are often borne two in each raceme.

3b. *Themeda gigantea* (Cav.) Hack. var. *novoguineensis* var. nov.

A typo differt spiculis masculinis dorso glabris vel scaberulis, haud ferrugineis vel brunneis basi tuberculatis patentibus dense hirsutis; spiculis hermaphroditis aristatis, aristis 2.5–3 cm. longis. A subsp. *caudata* Hackelii spiculis hermaphroditis in utroque racemo paucioribus et paullo brevioribus, spiculis masculinis brevioribus differt.

Racemes about 1.5 cm. long bearing usually 1 (rarely 2) perfect spikelets; involuclral spikelets 8–9 mm. long, scabrous on the keels, otherwise scaberulous; perfect spikelets brown, 7–9 mm. long including the 2–3 mm. long callus, dorsally puberulent-hispidulous, the hairs sometimes obscure toward the base; fertile lemma awned, the awn brown, 2.5–3 cm. long, geniculate at about the middle, the column puberulent-hispidulous.

BRITISH NEW GUINEA: Central Division: Astrolabe, *Armit* 44 (US); Rona, Laloki River, alt. 450 m., *Brass* 3589 (A, US) (very tall robust species; leaves glaucous when young); Baroka, Nakeo District, alt. 50 m., *Brass* 3710 (GH, TYPE, US), April, 1933 (the dominant grass on the lower *Eucalyptus* forest ridges; grows in large leafy clumps up to 3 meters high; leaves glaucous green); Port Moresby, alt. 200 m., *Brass* 8782 (A, US) (open savannah forest; dominant grass on stony hillsides; clumps 1.5–2 meters high); Kanosia, alt. about 30 m., *Carr* 11235 (US, NY) (on open grassland; grass about 10 ft. tall).

Differs from the species in having involuclral spikelets glabrous to scaberulous rather than pilose with reddish or brownish tuberculate-based spreading hairs, and in the awned fertile lemma. This variety is perhaps closest to subsp. *caudata* Hack., but in that the racemes bear 2 or 3 fertile spikelets, which are 9–11 mm. long, and involuclral spikelets 12–15 mm. long.

*Brass* 8782 was reported as *Themeda australis* (R. Br.) Stapf by Chase (17, p. 316), but that species (treated here as a synonym of *T. triandra*) has involuclral spikelets borne at the same level and the perfect spikelets dorsally glabrous, hispidulous only toward the apex.

#### 48. *Germainia* Bal. and Poitr.

*Germainia* Bal. and Poitr., Bull. Soc. Hist. Nat. Toulouse 7: 344. 1873.

Racemes long-exserted, solitary, capitulate, terminating the culms, composed of 3–6 sessile marginal staminate spikelets, the broad coriaceous first glumes forming an urn-like receptacle enclosing the long-awned perfect pediceled spikelets; sessile staminate spikelets 2-flowered, the second glume and lemmas membranous-hyaline; pediceled perfect spikelets terete or

somewhat flattened, disarticulating obliquely with a sharp bearded callus, the glumes chartaceous-indurate; fertile lemma bearing a long stout twisted and geniculate awn; slender erect perennials with flat blades.

TYPE SPECIES: *Germainia capitata* Bal. and Poitr.

1. *Germainia capitata* Bal. and Poitr., Bull. Soc. Hist. Nat. Toulouse 7: 345. fig. 1-9. 1873; Hitchc., Brittonia 2: 129. 1936.

Culms tufted, erect, 50-70 cm. tall, simple, glabrous, the nodes bearded; sheaths mostly slightly shorter than the internodes, keeled above and more or less densely pilose; ligule membranous, 1-1.5 mm. long; blades flat, linear, 10-25 cm. long, 3-5 mm. wide, both surfaces pubescent to pilose; racemes (excluding the awns) 15-20 mm. long, 3-8 mm. wide, terete, stramineous to tawny; sessile spikelets about 18 mm. long, the first glume slightly shorter, truncate, emarginate, usually ciliate, the second glume and lemmas puberulent toward their tips; fertile spikelets brown-hirtellous, the awn about 6 cm. long, geniculate in the upper third, the column brownish hirsute.

BRITISH NEW GUINEA: Western Division: Wuroi, Oriomo River, alt. 10-30 m., *Brass* 5727 (GH, US) (sporadic in small tufts on savannah ridges); Mabaduan, *Brass* 6555 (A, US) (scattered in savannah forests); Wassi Kussa River, *Brass* 8637 (A, US) (common on sub-acid soils of savannah forests); *MacGregor* 7 (US). NETHERLANDS NEW GUINEA: Balim River, alt. 1600 m., *Brass* 11722 (A, US) (usually dominant grass on sandy soil of deforested slopes).

India to China and New Guinea.

#### 49. *Heteropogon* Pers.

*Heteropogon* Pers., Syn. Pl. 2: 533. 1807.

Spikelets in pairs, the lower 1-several pairs homogamous, staminate or neuter, imbricate, persistent along the continuous rachis, the remaining pairs heterogamous, one sessile, perfect or pistillate, terete, long-awned, the other pediceled, staminate or neuter, similar to the homogamous spikelets below, the upper part of the rachis disarticulating obliquely at the base of each joint and forming a sharp barbed callus below the fertile spikelet, the pediceled spikelet readily falling, its pedicel obscured in the hairs of the callus; staminate spikelets awnless, the glumes membranous; first glume asymmetrical, one submarginal keel rather broadly winged, the other wingless; second glume narrower, symmetrical; lemmas hyaline, epaleate; fertile spikelets terete, the glumes coriaceous, the first brown-hirsute, enfolding the second; lemmas hyaline; awn of the fertile spikelets stout, twice geniculate, twisted and hirsute below the upper bend. Perennials or annuals with solitary spikelike cylindrical racemes terminating the culms and upper branches.

TYPE SPECIES: *Heteropogon glaber* Pers. = *H. contortus* (L.) Beauv. (*Andropogon contortus* L.).

#### KEY TO THE SPECIES

1. Fertile spikelets 6-8 mm. long including the 2 mm. long callus; plants 30-90 cm. tall.....1. *H. contortus*.
1. Fertile spikelets 12-14 mm. long including the 6 mm. long callus; plants robust, 1.5-3 meters tall.....2. *H. triticeus*.



1. *Heteropogon contortus* (L.) Beauv. ex. Roem. & Schult., Syst. Veg. 2: 836. 1817; C. T. White, Proc. Roy. Soc. Queensl. 34: 15. 1923; Hitchc., Lingnan Sci. Jour. 7: 250. pl. 11. 1931, U. S. Dept. Agric. Misc. Publ. 200: 756. fig. 1677. 1935; Brittonia 2: 129. 1936.

*Andropogon contortus* L., Sp. Pl. 1045. 1753; F. Muell., Pap. Pl. 1: 46. 1876. Type from India.

*Heteropogon hirtus* Pers., Syn. Pl. 2: 533. 1807. Based on *Andropogon contortus* L.

Perennial; culms tufted, erect, branching above, 30–90 cm. tall; sheaths compressed-keeled, glabrous; ligule membranous, about 1 mm. long, ciliate; blades linear, flat or folded, 3–6 mm. wide, scaberulous at least above and on the margins; racemes 3–7 cm. long, dorsiventral, straight or slightly curved; sessile spikelets 6–8 mm. long including the 2 mm. long callus, pubescent, dark brown, nearly hidden by the imbricate pedicel spikelets, the awn 6–10 cm. long; sterile spikelets with the first glume papillose-hispid toward the margins and the tip or sometimes nearly glabrous.

BRITISH NEW GUINEA: Central Division: Rona, Laloki River, alt. 450 m., Brass 3632 (GH, US) (one of the principal grasses of the lowland savannahs; not plentiful at this altitude); Kanosia, Carr 11174 (NY) (open savannah land). NORTH-EAST NEW GUINEA: Morobe District: Kajabit, Clemens 10713e, 10515 (US).

Tropical and warmer regions of both hemispheres.

2. *Heteropogon triticeus* (R. Br.) Stapf, Kew Bull. 1912: 432. 1912; Chase, Jour. Arnold Arb. 20: 316. 1939.

*Andropogon triticeus* R. Br., Prodr. Fl. Nov. Holl. 1: 201. 1810; Hack. in DC., Monogr. Phan. 6: 588. 1889. Type from Australia.

Perennial; culms robust, erect, 1.5–3 meters tall, glabrous; sheaths glabrous or nearly so, the lower overlapping, compressed-keeled, the upper shorter than the internodes, rounded or somewhat keeled above; ligule 1–1.5 mm. long, membranous, irregularly ciliate; blades usually folded (at least when dry), 40–60 cm. long, gradually tapering to the attenuate apex, more or less scabrous, at least on the margins, the upper surface sometimes sparsely pilose; racemes dorsiventral, similar to those of *Heteropogon contortus*, but considerably larger, as much as 15 cm. long exclusive of the awns; sessile spikelet 12–14 mm. long, including the 6 mm. long callus, puberulent, dark brown, almost completely hidden by the imbricate pedicel spikelets, the awn stout, 10–16 cm. long; glumes of sterile spikelets glabrous.

BRITISH NEW GUINEA: Western Division: Mabaduan, Brass 6538 (A, US) (of localized distribution on drier soils of savannah forest, dominant where it occurs).

India to Malaysia, Australia, and New Guinea.

A much larger, coarser, more robust species than *Heteropogon contortus*. The leaf blades are long, firm and attenuate, while those of *H. contortus* are usually flat and thinner in texture. The inflorescences of these two species are very similar, but that of *H. triticeus* is larger and coarser with larger spikelets.

### Tribe III. MAYDEAE

Spikelets unisexual, dissimilar, awnless, the sexes in different inflorescences or in different parts of the same inflorescence, the pistillate below; staminate spikelets 2-flowered, usually paired, one sessile, the other pedi-

celed, in solitary or paniced spikelike racemes; sessile spikelets 2-flowered, the lower floret sterile, solitary or sometimes accompanied by a pediceled staminate spikelet, embedded in hollows of a thickened articulate axis, enclosed in a thickened sheath, or crowded in rows on a thickened axis (cob); glumes membranous or indurated, lemmas hyaline. Annuals or perennials with usually tall culms and broad flat leaves.

#### KEY TO THE GENERA

1. Staminate and pistillate spikelets in separate portions of the same inflorescence, the pistillate below.
  2. Spikes elongate, the pistillate portion several to many-flowered, disarticulating into as many 1-seeded joints.....50. *Polytoca*.
  2. Spikes short, the pistillate portion 1-3-flowered, permanently enclosed within a shiny bead-like sheathing bract.....51. *Coix*.
1. Staminate and pistillate spikelets in separate inflorescences, the staminate in a terminal panicle, the pistillate borne in axils of the leaves.....52. *Zea*.

#### 50. *Polytoca* R. Br.

*Polytoca* R. Br. in Bennett, Pl. Jav. Rar. 20. *pl.* 5. 1838.

Spikelets unisexual, in the lower part of the raceme one sessile and pistillate, more or less sunken in the rachis, the other pediceled and staminate (in ours) or more or less reduced; spikelets in the upper part of the raceme all staminate (often the uppermost racemes entirely staminate); rachis of the staminate part of the raceme continuous, falling entire, of the lower pistillate part fragile, disarticulating into as many 1-seeded joints as there are spikelets; glumes of the staminate spikelets membranous or chartaceous, those of the pistillate spikelets coriaceous. Tall robust perennials with flat blades and terminal and lateral spikelike racemes borne in the upper sheaths.

TYPE SPECIES: *Polytoca barbata* R. Br. = *P. digitata* (L. f.) Henr. (*Apluda digitata* L. f.).

1. *Polytoca macrophylla* Benth., Jour. Linn. Soc. Bot. 19: 52. 1881; Hack., Bot. Jahrb. 13: 263. 1890; Henr., Med. Rijks Herb. Leiden 67: 12. *fig.* 1, 2. 1931; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 186. 1940. Type from the Louisiade Archipelago.

Culms caespitose, robust, freely branching, 2-3 meters tall, erect or somewhat geniculate at base and rooting from the lower nodes; sheaths slightly shorter than the internodes, glabrous or more or less papillose-hispid near the margins; ligule wanting or very short; blades flat, as much as 90 cm. long and 8 cm. wide, smooth and glabrous, the margins scabrous; rachis joints in the lower part of the raceme 5-7 mm. long, clavate and somewhat concave on the side next to the sessile spikelet, more or less pubescent on the back, especially toward the base; pistillate spikelets lanceolate, more than 1 cm. long, the first glume glabrous but minutely papillose-roughened on the back above the smooth callus, scabrous on the upper margins; pedicels of the pediceled staminate spikelets fused to the rachis joint for more than half their length; staminate spikelets about as large as the pistillate in the lower part of the raceme, reduced in size upward.

BRITISH NEW GUINEA: Central Division: Rona, Laloki River, alt. 450 m., *Brass* 3617 (GH, US) (rocky savannah slopes; tall erect species growing in clumps;

hairs stiff and irritant); Mafulu, alt. 1250 m., *Brass* 5485 (US) (massed in an old native garden); Kanosia, *Carr* 11344 (NY) (river bank); Gulf Division: Kerema, *Brass* 1203 (GH, US) (open ridges near coast; tall clumps of grass 5 ft. high); Northern Division: About 13 miles northwest of Oro Bay, *Reeder* 842 (A, US) (low ground at edge of swamp); Goodenough Island: Haiwali, *Burcham* 126 (US) (edge of clearing in rain forest). NORTHEAST NEW GUINEA: Morobe District: Kajabit, Markham Valley, *Clemens* 10552A (US) (growing on stream margins; plants 10 ft. or more tall); Boana, *Clemens* 41608 (US). NETHERLANDS NEW GUINEA: Mamberamo, Otken River, alt. about 60 m., *Docters van Leeuwen* 11368 (GH, NY). BISMARCK ARCHIPELAGO: Duke of York Islands: *W. Bradth* 5 (US); New Britain: Rabaul, *Herre* 198 (NY) (growing on roadsides; plants 10 ft. high). SOLOMON ISLANDS: San Cristoval: Waimamura, *Brass* 2629 (GH) (on old village and garden clearings; blades to 8 cm. wide); Bougainville: Kugumaru, *Kajewski* 1989 (GH) (a pest in native gardens).

Ternate to New Guinea and the Louisiade Archipelago.

The report by F. Muell. (Pap. Pl. 2: 20. 1885) of *Chionachne cyathopoda* (F. Muell.) Benth. = *Polytoca cyathopoda* (F. Muell.) Bailey is probably referable to this species.

## 51. Coix L.

*Coix* L., Sp. Pl. 972. 1753, Gen. Pl. ed. 5. 419. 1754.

Spikelets unisexual; staminate spikelets 2-flowered, in twos and threes on a slender continuous rachis; glumes membranous, lanceolate, obscurely nerved; lemmas and paleas hyaline, the stamens 3; pistillate spikelets 3 together, one fertile, the other two sterile and reduced to narrow tubular glumes; glumes of the fertile spikelet several-nerved, hyaline below, chartaceous in the upper pointed part, the first glume broad, enfolding the spikelet, the second narrower; sterile lemma similar but a little narrower; fertile lemma and palea hyaline; inflorescence consisting of an ovate, oval, or somewhat cylindrical pearly white or drab bead-like, very hard involucre (much modified sheathing bract) containing the pistillate portion of the inflorescence, the points of the pistillate spikelets and the slender axis of the staminate portion of the inflorescence protruding from the orifice at the apex, the staminate portion as much as 6 cm. long, soon deciduous. Annuals or perennials with branching culms and broad flat blades, the inflorescences numerous on stout peduncles clustered in the axils of the leaves.

TYPE SPECIES: *Coix Lacryma-Jobi* L.

1. *Coix Lacryma-Jobi* L., Sp. Pl. 972. 1753; Hack., Bot. Jahrb. 6: 237. 1885; Hitchc., U. S. Dept. Agric. Misc. Publ. 200: 765. fig. 1691. 1935; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 190. fig. 103. 1940. Type from India.

*Coix Lacryma* L., Syst. Nat. ed. 10. 1261. 1759 (presumably based on *C. Lacryma-Jobi* L.).

*Coix Lacryma-Jobi* L. var. *novoguineensis* Pilger, Bot. Jahrb. 52: 171. 1914. Type from Northeast New Guinea.

Annual; culms erect, stout, much branched upwards, 1-3 meters tall; sheaths glabrous; ligule membranous, ciliate, about 1 mm. long; blades glabrous, narrowly lanceolate, often cordate at base, acute, 10-60 (the lower sometimes to 120) cm. long, 2-5 cm. wide, the margins serrate-scabrous; staminate racemes 1-6 cm. long, glabrous; spikelets 8-10 mm.



long, the first glume winged on the keels; false fruits ovoid-globose, 6–12 mm. long, hard and shiny at maturity.

BRITISH NEW GUINEA: Central Division: Javarie, *White* 373 (US). NORTHEAST NEW GUINEA: Madang District: Sepik River, *Herre* 322, 335 (NY) (plants 6–8 ft. high, growing in water). NETHERLANDS NEW GUINEA: Arfak Mountains, Female Lake, alt. about 3000 m., *Pratt* in 1908 (US); Nassau Region: Explorat Biv., alt. about 1200 m., *Docters van Leeuwen* 10804 (GH). SOLOMON ISLANDS: Bougainville: Kugumaru, alt. 150 m., *Kajewski* 1840 (GH) (rain-forest; tall grass up to 2 meters tall).

Warmer regions of the world. Sometimes cultivated for the "beads," which are used as ornaments, or for the edible grains.

1a. *Coix Lacryma-Jobi* L. var. *stenocarpa* (Oliver) Stapf in Hook. f., Fl. Brit. Ind. 7: 100. 1897.

*Coix Lachryma* L. var. *stenocarpa* Oliver, Hook. Ic. 18: pl. 1764. 1888. Type from Burma.

*Coix stenocarpa* (Oliver) Balansa, Jour. de Bot. 4: 77. 1890. Type from Burma.

*Coix tubulosa* Hack., Bot. Jahrb. 13: 260. 1890. Type from Northeast New Guinea.

*Coix Lacryma-Jobi* L. var. *tubulosa* (Hack.) K. Schum. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 164. 1901.

Differs from the species in having nearly cylindrical rather than ovate or elliptical false fruits. In the specimen cited below the false fruits are about 3.5 mm. in diameter and 10–12 mm. long.

BRITISH NEW GUINEA: Eastern Division: Aisa River, *Brass* 1417 (GH) (tall riverbank grass 5–6 ft. tall; fruit glossy, gray).

Indo-Malayan region to New Guinea.

## 52. *Zea* L.

*Zea* L., Sp. Pl. 971. 1753, Gen. Pl. ed. 5. 419. 1754.

Spikelets unisexual; staminate spikelets 2-flowered, in pairs on a rather slender trigonous continuous rachis, one of the pair nearly sessile, the other pediceled; glumes membranous, acute; lemmas and paleas hyaline, the stamens 3; pistillate spikelets 1-flowered, densely crowded in many vertical rows on a cylindrical spongy rachis (cob); glumes broad, rounded or emarginate at apex; lemmas hyaline, the styles filiform, very long and slender, stigmatic nearly to the base. Robust annuals with terminal panicles of staminate racemes and axillary short-peduncled pistillate spikes (ears) enclosed in numerous sheaths (husks), the styles protruding from the end as a mass of silky threads.

TYPE AND ONLY SPECIES: *Zea Mays* L.

1. *Zea Mays* L., Sp. Pl. 971. 1753; Kärnbach, Bot. Jahrb. 16: Beibl. 37: 11. 1892; K. Schum. & Lauterb., Nachtr. Fl. Deutsch. Schutzgeb. Südsee 56. 1905; Pilger, Nat. Pflanzenfam. ed. 2. 14e: 194–201. fig. 106. 1940. Type from America.

Culms erect, robust, more or less succulent, 1–4 meters tall, unbranched, the basal internodes very short, the lower nodes giving rise to adventitious "prop roots"; blades broad and flat, sword-shaped, the midrib prominent.

Widely distributed, in cultivation, in temperate and tropical regions of the world. Known only in cultivation.

Numerous species have been described, but most botanists consider that *Zea* is monotypic but highly variable. No herbarium specimens of this species from New Guinea have been seen, but living plants were

observed in native gardens there by the writer in 1943-44. To what extent this species is cultivated by natives in New Guinea is unknown to me.

#### DOUBTFUL AND EXCLUDED SPECIES

*Andropogon australis* Spreng. sensu K. Schum., Notizbl. Bot. Gart. Berlin 1: 207. 1896 = *Sorghum*.

Probably a misidentification of *Sorghum nitidum*.

*Andropogon australis* Spreng. var. *laeviramis* Hack. apud K. Schum., Bot. Jahrb. 9: 197. 1887.

As far as I can discover, the above is a *nomen nudum*. Schumann and his co-workers used the name on at least three occasions, but a description was never published.

*Andropogon halepensis* Sibth. var. *propinquus* (Kunth) Hack., Bot. Jahrb. 6: 240. 1885, in Engler, Forschungsreise Gazelle 4(7): 5. 1889.

The above record from the New Guinea region probably represents a misidentification for *Sorghum nitidum*. The latter species is common in the region and is picked up by most collectors. I have seen no specimens of *S. propinquus* from New Guinea. A further reason for believing that the plants were *S. nitidum* is the fact that, although common, *S. nitidum* was not reported by the above authors.

*Andropogon Sorghum* (L.) Brot. subsp. *halepensis* (L.) Hack. var. *propinquus* (Kunth) Hack. in DC., Monogr. Phan. 6: 503. 1889; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 173. 1901.

See note under *Andropogon halepensis* var. *propinquus*.

*Anthistiria ciliata* L. f. sensu F. Muell., Pap. Pl. 1: 47. 1876.

According to C. T. White (75, p. 15) the specimen which Mueller cites under this name is *A. imberbis* Retz. = *Themeda triandra* Forsk.

*Arthraxon linifolius* Henr., Blumea 4: 525. 1941.

No specimens of this nor of the following species were available to me. From Henrard's descriptions they seem to be very close to *A. hispidus*. *Arthraxon pallidus* Henr., Blumea 4: 526. 1941.

See comment above.

*Chrysopogon Gryllus* (L.) Trin. sensu F. M. Bailey, Queensl. Agric. Jour. 23: 220. 1909.

This species has not been reported otherwise from New Guinea. I am not certain which species Bailey had, but it was probably *C. elongatus* or even *C. aciculatus*.

*Erianthus pedicellaris* (Trin.) Hack. sensu K. Schum., Notizbl. Bot. Gart. Berlin 1: 46. 1895.

This is the only report of this species from the region. Perhaps it represents a misidentification.

*Eriochloa punctata* (L.) Desv. sensu F. Muell., Pap. Pl. 1: 74. 1876; C. T. White, Proc. Roy. Soc. Queensl. 34: 15. 1923.

Probably the plants referred to this species are *E. procera* (Retz.) C. E. Hubb. I have seen no specimens of *E. punctata* from New Guinea.

*Ischaemum aristatum* L. var. *arfakense* Rendle in Gibbs, Contr. Phytogr. Fl. Arfak Mt. 89. 1917.

From the description this appears to be merely a synonym of *I. aristatum* L. (sensu meo) as applied to the New Guinea material.

*Ischaemum aristatum* L. var. *cylindricum* Pilger, Bot. Jahrb. 52: 171. 1914.

Unfortunately no specimens of *I. aristatum* were available from this region (Northeast New Guinea). The description suggests that this variety may be a synonym of *I. aristatum* L. subsp. *barbatum* Hack.

*Ischaemum chordatum* (Trin.) Hack., Bot. Jahrb. 13: 260. 1890; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 170. 1901.

*Spodiopogon chordatum* Trin., Mém. Acad. St. Pétersb. VI. 2: 302. 1832. Marianas and Carolines.

From Trinius' rather lengthy description, this species appears to be a synonym of *I. digitatum* Brongn.

*Ischaemum rugosum* Salisb. sensu Ridley, Trans. Linn. Soc. II. Bot. 9: 249. 1916.

I have seen no specimens nor do I know of any other record of this species from New Guinea. Ridley states that his plant is a dwarf about 15 cm. tall.

*Microstegium calochlous* (Lauterb. & K. Schum.) Pilger, Nat. Pflanzenfam. ed. 2. 14e: 122. 1940.

*Pollinia calochloa* Lauterb. & K. Schum. in K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 167. 1901. Type from Northeast New Guinea.

No New Guinea specimens examined match the description precisely, but from the ample description it seems to be only a variety of *Microstegium ciliatum* (Trin.) A. Camus. The ligule is said to be only about 0.5 mm. long, and the rachis joints are completely glabrous. The remainder of the description applies to *Pollinia ciliata* Trin. (sensu Hack. in DC., Monogr. Phan. 6: 176. 1889).

*Microstegium glabratum* (Brongn.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921; Ohwi, Bot. Mag. (Tokyo) 56: 10. 1942.

*Eulalia glabrata* Brongn. in Duperry, Bot. Voy. Coquille 93. pl. 19. 1831. Type from the Society Islands.

*Pollinia glabrata* (Brongn.) Trin., Mém. Acad. St. Pétersb. VI. 4: 89. 1836.

From Brongniart's description and figure, this species appears to be closely related to *Microstegium nudum* (Trin.) A. Camus, and I suspect it may be a synonym. The two species follow one another in Hackel's Monograph, and the distinctions separating them in that work seem very slight.

*Panicum brevifolium* L. sensu F. Muell., Pap. Pl. 2: 19. 1855.

This species was reported from New Guinea only by F. von Mueller in 1885. I have seen no reports from New Guinea since that date and suspect that it was probably a misidentification. Perhaps Mueller's plant was *Cyrtococcum patens* (L.) A. Camus, as that species bears a superficial resemblance to *Panicum brevifolium*.

*Panicum filiforme* L. sensu K. Schum., Notizbl. Bot. Gart. Berlin 1: 208. 1896 = *Digitaria filiformis* (L.) Koel.

This species was originally described from North America. I know of no other record of this plant from the New Guinea area. Perhaps Schumann's plant was *D. violascens* Link, which is common in the region. It is listed by Schumann as being a common weed of cultivated ground.



*Panicum foliosum* R. Br. sensu K. Schum., Bot. Jahrb. 9: 196. 1887 = *Brachiaria foliosa* (R. Br.) Hughes.

Reported from Finschhafen by Schumann. I know of no other record. It seems somewhat unlikely that this Australian species should occur in Northeast New Guinea and yet not be represented in the numerous collections which have been made on the Australian side of British New Guinea. Perhaps this represents a misidentification of *Brachiaria subquadriflora* (Trin.) Hitchc.

*Panicum interruptum* Willd. sensu Ridley, Trans. Linn. Soc. II. Bot. 9: 248. 1916.

From a fragment of the type specimen (at US), consisting of two somewhat crushed spikelets, this species seems referable to *Sacciolepis*. This is the only report of the species from New Guinea known to me.

*Panicum javanicum* Poir. sensu Burkill, Proc. Camb. Phil. Soc. 9: 93. 1896; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 177. 1901.

The original description is too inadequate to permit positive identification. Trinius (Mém. Acad. St. Pétersb. VI. 3: 243. 1834) lists *Urochloa panicoides* Beauv. as a synonym. Hooker f. (Fl. Brit. Ind. 7: 36. 1896), in a note under *P. javanicum*, states: "Kunth (Revis. Gram. i. 206) says, under *Urochloa panicoides*, that he has examined in Desfontaine's Herbarium the type of Poirét's *P. javanicum*, and identified it, which he cites as a syn. of *Urochloa panicoides*, but his figure of which again quite accords with a narrow-leaved form of *P. Helopus*, Trin. This requires the adoption [of] the name *javanicum* (by misprint *japonicum* in Kunth Revis.), for the species. Benthams, on the other hand (Fl. Austral. vii. 477), says that Munro has seen an authentic specimen of *javanicum*, and that it is quite distinct from *P. Helopus*. I have no means of verifying either authority."

Hitchcock (Jour. Wash. Acad. Sci. 9: 551. 1919) confidently states that *P. javanicum* Poir. is a synonym of *Panicum panicoides* (Beauv.) Hitchc. (*Urochloa panicoides* Beauv.). He states that since *P. javanicum* Poir. is described as having glabrous spikelets, and Beauvois' figure of *Urochloa panicoides* accompanying the original description shows the spikelets to be glabrous, they are synonyms. He further states that *P. Helopus* has pubescent spikelets and is thus excluded from consideration. It is interesting to note that all the specimens in the U.S. National Herbarium which have been labeled *P. javanicum* are from India — none are from Java. This leaves some doubt, I think, as to the identity of *P. javanicum*. Since C. E. Hubbard & Vaughan (39, p. 74) state under *Urochloa panicoides* that specimens of this species have been referred to *Panicum javanicum* Poir., it seems apparent that these authors do not agree with Hitchcock's interpretation.

*Panicum multinode* Lam. sensu F. Muell., Pap. Pl. 1: 31. 1876.

Mueller states that this seems referable to *P. repens* L. I have seen no specimens of this latter species from New Guinea. *Panicum multinode* Lam. is referable to the genus *Cyrtococcum*, which bears little resemblance to *Panicum repens*. Without seeing the actual specimens (of which none are cited by Mueller) it is impossible to determine to what species Mueller's report applies.

*Panicum papuanum* Mez, Bot. Jahrb. 56: Beibl. 125: 5. 1921.

Mez' original description is brief and quite inadequate. He states merely "Laminae anguste lineares. Nodi glabri. Inflorescentia laxa 3-pinnata. Spiculae quam pedicelli gracillimi breviores, glabrae, ellipticae, acutae, 2 mm. longae. Glumae I., II. = 7-, III. = 9-nervia. Flos inferior abortivus palea minuta. Palea floris herm. stramineae, politissimae." The specimen questionably referred to this species by Chase (17, p. 309) is *Panicum mindanaense* Merr. In that specimen both glumes and the sterile lemma are 5-nerved.

*Panicum parviflorum* R. Br. sensu K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 177. 1901 = *Digitaria parviflora* (R. Br.) Hughes.

This Australian species is reported from New Guinea only in Schumann's publications and probably represents a misidentification of another species such as *D. violascens*.

*Panicum plicatum* Lam. sensu F. Muell., Vict. Nat. 2: 20. 1855; Ridley, Trans. Linn. Soc. Bot. 9: 248. 1916; C. T. White, Proc. Roy. Soc. Queensl. 34: 16. 1923.

This is probably the species which I am calling *Setaria palmaefolia*. *Setaria plicata* (Lam.) T. Cooke is considered to be distinct by some authors, but the differences seem slight. I am not citing it as a synonym of *S. palmaefolia* pending further study.

*Panicum trachyrachis* Benth. sensu Hack., Bot. Jahrb. 13: 258. 1890; K. Schum., Notizbl. Bot. Gart. Berlin 2: 92. 1898.

An Australian species related to *P. virgatum* L. Reported by the German workers from Northeast New Guinea and the Bismarck Archipelago. The species may well occur in New Guinea, but I have seen no specimens.

*Panicum virgatum* L. sensu F. Muell., Pap. Pl. 1: 47. 1876; F. M. Bailey, Queensl. Agric. Jour. 9: 411. 1901.

This is the species which Bentham calls *P. trachyrachis* Benth. (See note under that species.)

*Paspalum foliosum* (R. Br.) K. Schum. & Holtr., Fl. Kais. Wilhelmsland 21. 1889.

Obviously an error for *Panicum foliosum* R. Br. = *Digitaria foliosa* (R. Br.) Hughes.

*Paspalum miliare* (Lam.) K. Schum. & Holtr., Fl. Kais. Wilhelmsland 21. 1889.

An error for *Panicum miliare* Lam. In K. Schum. & Lauterb. (69, p. 179), *P. miliare* sensu K. Schum. in Fl. Kais. Wilhelmsland (non Lam.) is listed as a synonym under *Panicum caesium* Nees = *P. cambogiense* Balansa.

*Paspalum parviflorum* (R. Br.) K. Schum. & Holtr., Fl. Kais. Wilhelmsland 21. 1889 = *Digitaria parviflora* (R. Br.) Hughes.

Obviously an error in copying *Panicum parviflorum*. See note under that species.

*Pennisetum cenchroides* (L.) Rich. sensu F. M. Bailey, Queensl. Agric. Jour. 23: 220. 1909 = *Pennisetum ciliare* (L.) Link.

This species occurs in Australia and, although I have seen no specimens, perhaps also in New Guinea. The above is the only record from New

Guinea known to me. C. T. White (75, p. 16) says Bailey's plant is *Cenchrus echinatus* L.

*Rottboellia brevis* Chauvin ex Steud., Syn. Pl. Glum. 1: 361. 1854.

This species was described from a specimen collected on the island of Waigiou. Hackel (23, p. 313) lists it under "species inextricabilis." I have no further information.

*Rottboellia Coelorachis* Forst. sensu Hack. in Engler, Forschungsreise Gazelle 4(7): 4. 1889.

According to Hackel (23, p. 294) and Pilger (59, p. 138) this is a distinct species from *R. exaltata*. I have seen no specimens which I could segregate.

*Setaria aurea* Hochst. sensu Hack., Denkschr. Akad. Wiss. Math.-Naturw. (Wien) 89: 495. 1913.

This is apparently the species which I am calling *Setaria pallide-fusca* (Schum.) Stapf & Hubb., as there are some sheets in the U.S. National Herbarium labeled *S. aurea* which seem to be *S. pallide-fusca*.

*Setaria verticillata* (L.) Beauv. sensu K. Schum., Notizbl. Bot. Gart. Berlin 2: 94. 1898.

The above is the only report of this species from the New Guinea region known to me. It may well occur there, but I have seen no specimens.

*Stenotaphrum subulatum* Trin. sensu Hack., Bot. Jahrb. 6: 237. 1885; F. Muell., Pap. Pl. 6: 19. 1885; K. Schum., Bot. Jahrb. 9: 196. 1887.

The above reports were all based on a single collection. No other report of this species from New Guinea is known to me. It is perhaps a misidentification or the locality of the specimen may be erroneous.

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## LIST OF CITED SPECIMENS

- ARMIT, W. 44. *Themeda gigantea* var. *novoguineensis*; 55. *Imperata exaltata*.  
 ARNOT, W. E. 38. *Digitaria Baileyi*.  
 BAIM, T. C. —. *Pogonatherum panicum* (March 12, 1943).  
 BAUERLEN, W. 40. *Echinochloa colonum*; 43. *Pogonatherum panicum*; 60. *Erianthus arundinaceus*; 61. *Panicum cambogiense*.  
 BRADTHE, W. 5. *Polytoca macrophylla*.  
 BRASS, L. J. 514. *Ischaemum muticum*; 521. *Paspalum longifolium*; 522. *Apluda mutica*; 538. *Pennisetum macrostachyum*; 634. *Themeda gigantea* var. *amboinensis*; 765. *Themeda triandra*; 768. *Pogonatherum panicum*; 776. *Rottboellia rottboelliioides*; 920. *Miscanthus floridulus*; 1018. *Isachne Brassii*; 1177. *Ischaemum muticum*; 1183. *Paspalum scrobiculatum*; 1203. *Polytoca macrophylla*; 1205. *Themeda gigantea* var. *amboinensis*; 1213. *Ischaemum digitatum* var. *polystachyum*; 1229. *Paspalum vaginatum*; 1391. *Pogonatherum panicum*; 1397. *Elyonurus citreus*; 1417. *Coix Lacryma-Jobi* var. *stenocarpa*; 1423. *Cyrtococcum oxyphyllum*; 1534. *Oplismenus hirtellus*;



1616. *Ischaemum muticum*; 2551. *Themeda triandra*; 2593. *Ischaemum littorale*; 2629. *Polytoca macrophylla*; 2646. *Ischaemum muticum*; 2732. *Cyrtococcum oxyphyllum*; 2813bis. *Ischaemum littorale*; 2817. *Paspalum conjugatum*; 2841. *Paspalum orbiculare*; 2857. *Themeda gigantea* var. *amboinensis*; 2857A. *Cyrtococcum oxyphyllum*; 2893. *Pogonatherum panicum*; 3070. *Thuarea involuta*; 3126. *Themeda gigantea* var. *amboinensis*; 3241. *Themeda triandra*; 3386. *Pogonatherum panicum*; 3405. *Isachne Schmidtii*; 3518. *Themeda gigantea*; 3558. *Andropogon micranthus*; 3586. *Ophiuros exaltatus*; 3589. *Themeda gigantea* var. *novoguineensis*; 3610. *Pennisetum macrostachyum*; 3613. *Apluda mutica*; 3617. *Polytoca macrophylla*; 3628. *Saccharum spontaneum*; 3629. *Sorghum nitidum*; 3631. *Panicum viale*; 3632. *Heteropogon contortus*; 3639. *Brachiaria fusiformis*; 3647. *Oplismenus hirtellus*; 3692. *Themeda triandra*; 3701. *Hackelochloa granularis*; 3702. *Rottboellia rottboellioides*; 3710. *Themeda gigantea* var. *novoguineensis*; 3713. *Cymbopogon procerus*; 3723. *Themeda triandra*; 3724. *Ophiuros exaltatus*; 3820. *Cyrtococcum oxyphyllum*; 3935. *Paspalum conjugatum*; 4132. *Isachne villosa*; 4191. *Miscanthus floridulus*; 4528. *Miscanthus floridulus*; 4642. *Isachne Myosotis*; 4721. *Imperata exaltata* subsp. *Merrillii*; 4723. *Miscanthus floridulus*; 4778. *Miscanthus floridulus*; 4787. *Arthraxon hispidus*; 4788. *Setaria montana*; 4789. *Sacciolepis indica*; 4792. *Setaria palmaefolia*; 4799. *Andropogon micranthus*; 4802. *Dimeria dipteros*; 4807. *Isachne globosa*; 4808. *Ischaemum digitatum* var. *polystachyum*; 4813. *Imperata exaltata*; 4817. *Hyparrhenia bracteata*; 4871. *Isachne arfakensis*; 5208. *Panicum sarmentosum*; 5270. *Pogonatherum panicum*; 5310. *Rottboellia rottboellioides*; 5403. *Apluda mutica*; 5482. *Setaria pallide-fusca*; 5483. *Sacciolepis indica*; 5485. *Polytoca macrophylla*; 5513. *Pennisetum macrostachyum*; 5522. *Digitaria pruriens*; 5532. *Ischaemum digitatum* var. *polystachyum*; 5594. *Cyrtococcum oxyphyllum*; 5617. *Cyrtococcum patens*; 5710. *Eulalia trispicata*; 5725. *Cymbopogon procerus*; 5726. *Ischaemum aristatum*; 5727. *Germainia capitata*; 5733. *Eulalia irritans*; 5735. *Ophiuros exaltatus*; 5740. *Setaria pallide-fusca*; 5743. *Eremochloa bimaculata*; 5744. *Sacciolepis indica*; 5745. *Allotheropsis semialata*; 5827. *Sacciolepis indica*; 5828. *Panicum distans*; 5854. *Isachne confusa*; 5873. *Themeda triandra*; 5895. *Sorghum nitidum*; 5910. *Brachiaria holosericea*; 5911. *Dimeria ciliata*; 5922. *Paspalum longifolium*; 5923. *Panicum Archboldii*; 5926. *Eulalia trispicata*; 5927. *Themeda triandra*; 5928. *Ischaemum aristatum* subsp. *barbatum*; 5957. *Apluda mutica*; 5960. *Panicum mindanaense*; 5961. *Ischaemum fragile*; 5984. *Dimeria glabriuscula*; 5985. *Andropogon brevifolius*; 6001. *Hemarthria subulata*; 6014. *Thaumastochloa rariflora*; 6029. *Sacciolepis myosuroides*; 6040. *Ischaemum aristatum* subsp. *barbatum*; 6044. *Echinochloa colonum*; 6045. *Chrysopogon elongatus*; 6060. *Echinochloa crusgalli*; 6252. *Sorghum nitidum*; 6253. *Ischaemum aristatum* subsp. *barbatum*; 6254. *Rottboellia rottboellioides*; 6260. *Panicum nodosum*; 6269. *Themeda triandra*; 6270. *Setaria pallide-fusca*; 6283. *Chrysopogon elongatus*; 6285. *Paspalum vaginatum*; 6295. *Cyrtococcum patens*; 6296. *Rottboellia exaltata*; 6297. *Paspalum scrobiculatum*; 6300. *Echinochloa colonum*; 6301. *Brachiaria subquadriflora*; 6303. *Panicum reptans*; 6305. *Digitaria pruriens*; 6339. *Ischaemum digitatum*; 6341. *Paspalum longifolium*; 6342. *Panicum Archboldii*; 6343. *Allotheropsis semialata*; 6350. *Panicum macrocladum*; 6364. *Cymbopogon procerus*; 6382. *Themeda gigantea* var. *amboinensis*; 6387. *Panicum distans*; 6395. *Cenchrus Brownii*; 6397. *Pennisetum macrostachyum*; 6404. *Andropogon annulatus*; 6408. *Paspalum vaginatum*; 6410. *Ischaemum muticum*; 6426. *Chrysopogon aciculatus*; 6431. *Apluda mutica*; 6474. *Themeda frondosa*; 6484. *Panicum Archboldii*; 6485. *Panicum mindanaense*; 6486. *Ischaemum fragile*; 6524. *Eulalia irritans*; 6537. *Ophiuros exaltatus*; 6538. *Heteropogon triticeus*; 6554. *Thaumastochloa rariflora*; 6555. *Germainia capitata*; 6568. *Panicum macrocladum*; 6582. *Erianthus arundinaceus*; 6585. *Echinochloa stagnina*; 6810. *Pogonatherum panicum*; 6945. *Imperata exaltata*; 6948. *Paspalum scrobiculatum*; 6957. *Saccharum spontaneum*; 6961. *Sacciolepis indica*; 7364. *Isachne Brassii*; 7483. *Oplismenus hirtellus*; 7519. *Sacciolepis indica*; 7522. *Panicum mindanaense*; 7528. *Ischaemum digitatum*; 7529. *Paspalum scrobiculatum*; 7552. *Hemarthria subulata*; 7600. *Pseudoraphis squarrosa*; 7602. *Isachne*

*globosa*; 7613. *Hymenachne amplexicaulis*; 7643. *Ophiuros exaltatus*; 7644. *Sorghum nitidum*; 7645. *Eulalia irritans*; 7647. *Panicum paludosum*; 7768. *Themeda gigantea* var. *amboinensis*; 7771. *Apluda mutica*; 7773. *Cyrtococcum patens*; 7806. *Dimeria monostachya*; 7807. *Dimeria ciliata* var. *heteromorpha*; 7808. *Eremochloa ciliaris* var. *elata*; 7809. *Eulalia trispicata*; 7810. *Brachiaria holosericea*; 7812. *Andropogon brevifolius*; 7832. *Isachne confusa*; 7849. *Eremochloa ciliaris* var. *elata*; 7850. *Dimeria glabriuscula*; 7851. *Panicum mindanaense*; 7852. *Panicum mindanaense*; 7854. *Sacciolepis myosuroides*; 7874. *Ischaemum fragile*; 7880. *Sacciolepis indica*; 7883. *Setaria pallide-fusca*; 7889. *Cyrtococcum patens*; 7900. *Ischaemum aristatum*; 7920. *Elyonurus citreus*; 7924. *Alloteropsis semialata*; 7932. *Dimeria ciliata* var. *heteromorpha*; 7933. *Andropogon sanguineus*; 7934. *Ischaemum fragile*; 7950. *Eulalia trispicata*; 7957. *Panicum sarmentosum*; 8220. *Pogonatherum paniceum*; 8251. *Eulalia irritans*; 8254. *Rottboellia rottboellioides*; 8259. *Ischaemum aristatum*; 8260. *Ischaemum aristatum* subsp. *barbatum*; 8263. *Sorghum nitidum*; 8279. *Eulalia trispicata*; 8280. *Echinochloa crusgalli*; 8296. *Imperata cylindrica* var. *major*; 8302. *Paspalum scrobiculatum*; 8324. *Digitaria radicata*; 8325. *Paspalum conjugatum*; 8343. *Panicum distans*; 8351. *Sacciolepis indica*; 8370. *Cymbopogon procerus*; 8408. *Eremochloa bimaculata*; 8409. *Alloteropsis semialata*; 8460. *Chrysopogon filipes* var. *arundinaceus*; 8470. *Pseudoraphis squarrosa*; 8537. *Sclerandrium truncatiglume*; 8566. *Eulalia trispicata*; 8567. *Sorghum nitidum*; 8579. *Chrysopogon elongatus*; 8637. *Germainia capitata*; 8654. *Panicum marginatum*; 8665. *Sclerandrium truncatiglume*; 8695. *Digitaria Baileyi*; 8696. *Panicum distans*; 8697. *Eulalia trispicata*; 8713. *Sacciolepis indica*; 8735. *Cleistochloa Sclerachne*; 8751. *Ischaemum aristatum*; 8776. *Sacciolepis indica*; 8782. *Themeda gigantea* var. *novoguineensis*; 8787. *Andropogon annulatus*; 8815. *Ischaemum aristatum* subsp. *barbatum*; 8893. *Pennisetum macrostachyum*; 8909. *Ichnanthus vicinus*; 8920. *Saccharum spontaneum*; 9556. *Isachne Myosotis*; 10235. *Imperata exaltata* subsp. *Merrillii* [with E. Meyer-Drees]; 10704. *Isachne Myosotis*; 10735. *Arthraxon hispidus*; 10736. *Sacciolepis indica*; 10743. *Isachne globosa*; 10746. *Setaria montana*; 10901. *Eulalia leptostachys*; 10902. *Imperata exaltata* subsp. *Merrillii*; 11363. *Eulalia leptostachys*; 11374. *Saccharum spontaneum*; 11385. *Ischaemum digitatum*; 11471. *Setaria palmaefolia*; 11488. *Setaria montana*; 11491. *Imperata exaltata* subsp. *Merrillii*; 11524. *Sacciolepis indica*; 11542. *Isachne globosa*; 11559. *Isachne albens*; 11568. *Pogonatherum paniceum*; 11583. *Isachne Myosotis*; 11584. *Miscanthus floridulus*; 11616. *Andropogon spicigerus*; 11617. *Ischaemum pubescens*; 11618. *Sorghum nitidum*; 11631. *Pogonatherum paniceum*; 11678. *Themeda gigantea* var. *amboinensis*; 11722. *Germainia capitata*; 11723. *Andropogon brevifolius*; 11732. *Ischaemum pubescens*; 11738. *Dimeria dipteros*; 11777. *Pennisetum macrostachyum*; 11778. *Saccharum spontaneum*; 11793. *Echinochloa crusgalli*; 11798. *Apluda mutica*; 11803. *Echinochloa crusgalli*; 11805. *Andropogon spicigerus*; 11806. *Ischaemum digitatum*; 11809. *Miscanthus floridulus*; 11813. *Digitaria radicata*; 11814. *Setaria montana* [specimen at A]; 11814. *Setaria pallide-fusca* [specimen at US]; 11817. *Paspalum scrobiculatum*; 11822. *Digitaria violascens*; 11823. *Isachne globosa*; 11824. *Sacciolepis indica*; 11825. *Eulalia leptostachys*; 11845. *Andropogon spicigerus*; 12364. *Oplismenus hirtellus*; 12370. *Isachne villosa*; 12475. *Isachne villosa*; 13201. *Isachne Myosotis*; 13210. *Ichnanthus vicinus*; 13263. *Setaria palmaefolia*; 13264. *Saccharum spontaneum*; 13479. *Pogonatherum paniceum*; 13719. *Oplismenus hirtellus*; 13720. *Microstegium spectabile*; 13721. *Ischaemum digitatum* var. *polystachyum*; 13784. *Paspalum scrobiculatum*; 13785. *Echinochloa stagnina*; 13791. *Saccharum spontaneum*; 13942. *Panicum auritum*; 13946. *Panicum zizanioides*; 14055. *Isachne Brassii*.

BRITTON, M. E. 22. *Setaria italica*.

BURCHAM, L. T. 119. *Apluda mutica*; 120. *Digitaria pruriens*; 121. *Sorghum nitidum*; 122. *Paspalum scrobiculatum* var. *bispicatum*; 124. *Rottboellia rottboellioides*; 125. *Setaria pallide-fusca*; 126. *Polytoca macrophylla*; 128. *Panicum nodosum*; 129. *Paspalum scrobiculatum*; 130. *Paspalum orbiculare*; 131. *Alloteropsis semialata*; 133. *Setaria palmaefolia*; 134. *Paspalum paniculatum*; 135. *Cyrtococcum patens*; 136. *Chrysopogon aciculatus*; 137. *Oplismenus compositus*; 138. *Oplismenus hirtellus*;

139. *Cyrtococcum oxyphyllum*; 140. *Ischaemum digitatum* var. *polystachyum*; 141. *Andropogon micranthus*.

CARR, C. E. 11022. *Echinochloa colonum*; 11025. *Paspalum conjugatum*; 11031. *Digitaria pruriens*; 11032. *Panicum nodosum*; 11033. *Chrysopogon aciculatus*; 11048. *Panicum viale*; 11054. *Alloteropsis semialata*; 11091. *Panicum reptans*; 11104. *Panicum viale*; 11106. *Andropogon micranthus* var. *muticispiculus*; 11108. *Digitaria abortiva*; 11111. *Sorghum nitidum*; 11129. *Saccharum spontaneum*; 11133. *Themeda triandra*; 11134. *Ophiuros exaltatus*; 11135. *Sorghum nitidum*; 11180. *Cenchrus echinatus*; 11235. *Themeda gigantea* var. *novoguineensis*; 11244. *Imperata exaltata*; 11309. *Andropogon micranthus* var. *muticispiculus*; 11329. *Andropogon intermedius*; 11344. *Polytoca macrophylla*; 11345. *Pogonatherum panicum*; 11355. *Setaria palmaefolia*; 11382. *Setaria surgens*; 11398. *Brachiaria subquadripara* var. *piligera*; 11413. *Ischaemum muticum*; 11417. *Thuarea involuta*; 11435. *Eriochloa procera*; 11439. *Digitaria sanguinalis*; 11440. *Digitaria pruriens*; 11445. *Spinifex littoreus* var. *longifolius*; 11503. *Cyrtococcum patens* var. *Warburgii*; 11546. *Alloteropsis semialata*; 11622. *Panicum creperum*; 11658. *Pennisetum macrostachyum*; 11736. *Ischaemum digitatum*; 11741. *Apluda mutica*; 11771. *Cyrtococcum oxyphyllum*; 11786. *Cyrtococcum oxyphyllum*; 11964. *Cyrtococcum trigonum*; 12236. *Microstegium spectabile*; 12362. *Isachne pauciflora*; 12412. *Isachne Myosotis*; 12525. *Panicum sarmentosum*; 12941. *Cyrtococcum oxyphyllum*; 12971. *Isachne Myosotis*; 14271. *Isachne villosa*.

CHALMERS, REV. J. 42. *Panicum sarmentosum*; 59. *Cyrtococcum oxyphyllum*; 71. *Eulalia irritans*; 72. *Panicum sarmentosum*.

CLEMENS, M. S. 34. *Sorghum laxiflorum*; 312. *Isachne Myosotis*; 1410. *Saccharum spontaneum*; 4053. *Sacciolepis indica*; 4105. *Isachne albens*; 4280. *Panicum ambiguum*; 4303. *Panicum sarmentosum*; 4307. *Hackelochloa granularis*; 4315. *Sacciolepis indica*; 4332. *Ichnanthus vicinus*; 4454. *Miscanthus floridulus*; 4498. *Setaria montana*; 4592. *Isachne albens*; 4725. *Eulalia leptostachys*; 4775. *Echinochloa crusgalli*; 4860. *Isachne villosa*; 4956. *Isachne villosa*; 5409. *Isachne albens*; 5476. *Echinochloa crusgalli*; 5756. *Oplismenus hirtellus*; 5856. *Isachne villosa*; 5924. *Isachne villosa*; 6097. *Isachne Myosotis*; 6120. *Digitaria perpusilla*; 6145. *Miscanthus floridulus*; 6548a. *Pogonatherum panicum*; 6558. *Saccharum spontaneum*; 6958a. *Isachne albens*; 9209. *Isachne arfakensis*; 9239. *Isachne albens*; 10279. *Microstegium nudum*; 10359. *Digitaria violascens*; 10379. *Isachne albens*; 10441. *Sorghum laxiflorum*; 10458. *Andropogon micranthus*; 10459bis. *Alloteropsis semialata*; 10475. *Panicum reptans*; 10476-s. *Echinochloa colonum*; 10477. *Andropogon brevifolius*; 10515. *Heteropogon contortus*; 10540J. *Setaria pallide-fusca*; 10541. *Andropogon micranthus* var. *muticispiculus*; 10541bis. *Andropogon micranthus*; 10552. *Pogonatherum panicum*; 10552A. *Polytoca macrophylla*; 10568. *Oplismenus compositus*; 10630. *Digitaria pruriens*; 10631. *Apluda mutica*; 10650. *Echinochloa crusgalli*; 10665. *Sorghum nitidum*; 10668b. *Imperata cylindrica* var. *major*; 10696. *Panicum paludosum*; 10706. *Paspalum longifolium*; 10713e. *Heteropogon contortus*; 10857. *Eulalia leptostachys*; 10955bis. *Sacciolepis indica*; 10980. *Sorghum laxiflorum*; 11047. *Paspalum orbiculare*; 11272. *Cyrtococcum patens*; 40782. *Hackelochloa granularis*; 40793. *Pennisetum macrostachyum*; 40838. *Ophiuros exaltatus*; 40867. *Hackelochloa granularis*; 40885. *Isachne Myosotis*; 41090. *Sorghum laxiflorum*; 41172. *Pennisetum macrostachyum*; 41238. *Ichnanthus vicinus*; 41356a. *Sacciolepis indica* mixed with *S. myosuroides*; 41608. *Polytoca macrophylla*; 41714. *Isachne villosa*; 41715. *Microstegium spectabile*; 41808. *Ichnanthus vicinus*; —. *Isachne Brassii* (October 20, 1940); —. *Brachiaria coccosperma* (February 21, 1940).

DOCTERS VAN LEEUWEN, W. M. 9252. *Paspalum conjugatum*; 9709. *Echinochloa crusgalli*; 9727. *Pennisetum macrostachyum*; 10167. *Echinochloa crusgalli*; 10498. *Digitaria radicata*; 10500. *Imperata exaltata*; 10787. *Isachne Myosotis*; 10804. *Coix Lacryma-Jobi*; 10809. *Sacciolepis indica*; 10814. *Setaria palmaefolia*; 11149. *Hymenachne amplexicaulis*; 11368. *Polytoca macrophylla*.

HARTMAN, E. 73. *Panicum sarmentosum*.



HERRE, A. W. 132. *Pennisetum macrostachyum*; 185. *Ischaemum muticum*; 198. *Polytoca macrophylla*; 231. *Imperata exaltata*; 284. *Saccharum spontaneum*; 313. *Setaria palmaefolia*; 319. *Echinochloa stagnina*; 322. *Coix Lacryma-Jobi*; 335. *Coix Lacryma-Jobi*.

HOMBRON, J. B. 1841. *Panicum ambiguum*.

JESWIET, J. —. *Saccharum spontaneum* (June, 1928); —. *Saccharum spontaneum* (July, 1928).

KAJEWSKI, S. F. 1779. *Setaria palmaefolia*; 1840. *Coix Lacryma-Jobi*; 1897. *Panicum cambogiense*; 1989. *Polytoca macrophylla*; 2139. *Cyrtococcum oxyphyllum*; 2245. *Pennisetum macrostachyum*; 2253. *Cyrtococcum patens*.

KANEHIRA, R., & S. HATUSIMA. 13093. *Panicum mindanaense* var. *villosa*; 13160. *Oplismenus hirtellus*; 13243. *Microstegium ciliatum* var. *laxum*; 13291. *Erianthus fastigiatus*; 13371. *Setaria pallide-fusca*; 13390. *Andropogon brevifolius* var. *cryptopodus*; 13588. *Isachne arfakensis*; 13826. *Sacciolepis indica*; 14019. *Isachne albens*; 14144. *Brachiaria subquadripara*; 14221. *Isachne Brassii*.

KING, REV. COPELAND. 1018. *Apluda mutica*; —. *Panicum cambogiense* (in 1912).

KLOSS, C. B.—. *Sacciolepis indica* (Jan. 1913).

LAUTERBACH, K. 24. *Pennisetum macrostachyum*.

LEDERMANN, C. 10444. *Isachne Brassii*.

MACFARLANE, S. 48. *Apluda mutica*.

MACGREGOR, SIR WILLIAM. 7. *Germainia capitata*; 8. *Eulalia irritans* var. *egregia*; 10. *Andropogon micranthus*; 11. *Setaria surgens*; 12. *Panicum sarmentosum*; 13. *Setaria surgens*; 14. *Echinochloa crusgalli*; 18. *Panicum macrocladum*; 19. *Rottboellia rottboellioides*; 20. *Andropogon micranthus*; 21. *Panicum viale*; 37. *Allotheropsis semialata*; 41. *Panicum sarmentosum*; 46. *Chrysopogon elongatus*; 50. *Isachne villosa*; 52. *Andropogon micranthus* var. *muticispiculus*; 53. *Eulalia irritans*; —. *Cenchrus Brownii* (in 1889).

NAUMANN, C. —. *Pennisetum macrostachyum* (Aug. 8, 1875).

PARKINSON, R. 45. *Sorghum nitidum*; 47. *Ischaemum muticum*; 64. *Themeda gigantea* var. *amboinensis*; 65. *Imperata exaltata*; 66. *Digitaria pruriens*.

PEEKEL, G. 301. *Digitaria longissima*.

PRATT, A. E. —. *Coix Lacryma-Jobi* (Dec. 1908).

REEDER, J. R. 799. *Paspalum conjugatum*; 801. *Andropogon micranthus* var. *muticispiculus*; 802. *Allotheropsis semialata*; 803. *Themeda triandra*; 804. *Setaria pallide-fusca*; 805. *Paspalum paniculatum*; 806. *Hackelochloa granularis*; 808. *Sorghum nitidum*; 809. *Rottboellia rottboellioides* [specimen at A]; 809. *Ophiuros exaltatus* [specimen at US]; 810. *Andropogon micranthus* var. *muticispiculus*; 811. *Digitaria longiflora*; 812. *Chrysopogon aciculatus*; 813. *Imperata exaltata*; 815. *Paspalum scrobiculatum* var. *bispicatum*; 817. *Digitaria radicata*; 818. *Paspalum scrobiculatum*; 819. *Apluda mutica*; 820. *Cyrtococcum oxyphyllum*; 821. *Eulalia trispicata*; 822. *Sorghum laxiflorum*; 823. *Sacciolepis indica*; 824. *Cyrtococcum patens*; 825. *Sacciolepis indica*; 826. *Paspalum scrobiculatum*; 828. *Saccharum spontaneum*; 829. *Digitaria pruriens*; 833. *Digitaria violascens*; 841. *Brachiaria subquadripara*; 842. *Polytoca macrophylla*; 845. *Ischaemum digitatum* var. *polystachyum*; 847. *Sacciolepis indica*; 849. *Andropogon brevifolius* var. *paradoxus*; 855. *Setaria pallide-fusca*; 868. *Oplismenus hirtellus*; 885. *Setaria palmaefolia*; 886. *Pogonatherum panicum*; 904. *Panicum cambogiense*; 905. *Panicum mindanaense*.

RODATZ & KLINK. 69. *Oplismenus compositus*.

ROGERS, H. J. 3001. *Imperata cylindrica* var. *major*; 3003. *Andropogon micranthus* var. *muticispiculus*; 3004. *Themeda triandra*.

RUSSELL, DEKALB, JR. —. *Oplismenus compositus* (May 23, 1943).

SAWYER, F. E. 32. *Echinochloa colonum*; 34. *Paspalum conjugatum*; 51. *Rottboellia rottboellioides*; 52. *Echinochloa colonum*; 81. *Imperata cylindrica* var. *major*; 82. *Cenchrus echinatus*; 83. *Digitaria sanguinalis*; 91. *Panicum reptans*; 92. *Digitaria sanguinalis*; 93. *Paspalum orbiculare*; 94. *Paspalum scrobiculatum*; 108. *Paspalum conjugatum*; 143. *Sacciolepis indica*; 144. *Chrysopogon aciculatus*; 163. *Chrysopogon aciculatus*.

SAWYER, W. S. 76. *Eulalia leptostachys*.

SIGAFOOS, R. 28. *Themeda triandra*; 68. *Sorghum nitidum*.

SMITH, L. S. 98 (N. G.). *Eulalia trispicata*.

TURNER, L. —. *Ischaemum Turneri*.

WARBURG, O. 20968. *Apluda mutica*.

WEINLAND, C. A. F. 75. *Digitaria pruriens*; 266. *Ophiuros exaltatus*; 276. *Cyrtococcum patens*; 278. *Cyrtococcum oxyphyllum*; 279. *Oplismenus compositus*; 281. *Sorghum nitidum*; 290. *Apluda mutica*; 347. *Ischaemum muticum*; 357. *Setaria pallide-fusca*; —. *Panicum reptans* (in 1889-91).

WHITE, C. T. 30. *Apluda mutica*; 373. *Coix Lacryma-Jobi*.

ZAHN, H. —. *Imperata cylindrica* var. *major*.

## EXPLANATION OF PLATES

All figures are drawn from types.

### PLATE V

*Dimeria monostachya* Reeder (*Brass* 7806): a. habit,  $\times \frac{1}{2}$ ; b. spikelet,  $\times 10$ .  
*Hemarthria subulata* Reeder (*Brass* 6001): c. inflorescence,  $\times \frac{1}{2}$ ; d. & e. two views of lower spikelet attached to the rachis joint,  $\times 10$ .

### PLATE VI

*Dimeria dipteros* Reeder (*Brass* 11738): a. habit,  $\times \frac{1}{2}$ ; b. spikelet,  $\times 10$ .

### PLATE VII

*Ischaemum littorale* Reeder (*Brass* 2593): a. habit,  $\times \frac{1}{2}$ ; b. pair of spikelets attached to the rachis joint; c. dorsal view of first glume of the lower spikelet (b & c,  $\times 10$ ).

*Eulalia irritans* (R. Br.) Kuntze var. *egregia* Reeder (*MacGregor* 8): d & e. two views of spikelet,  $\times 10$ .

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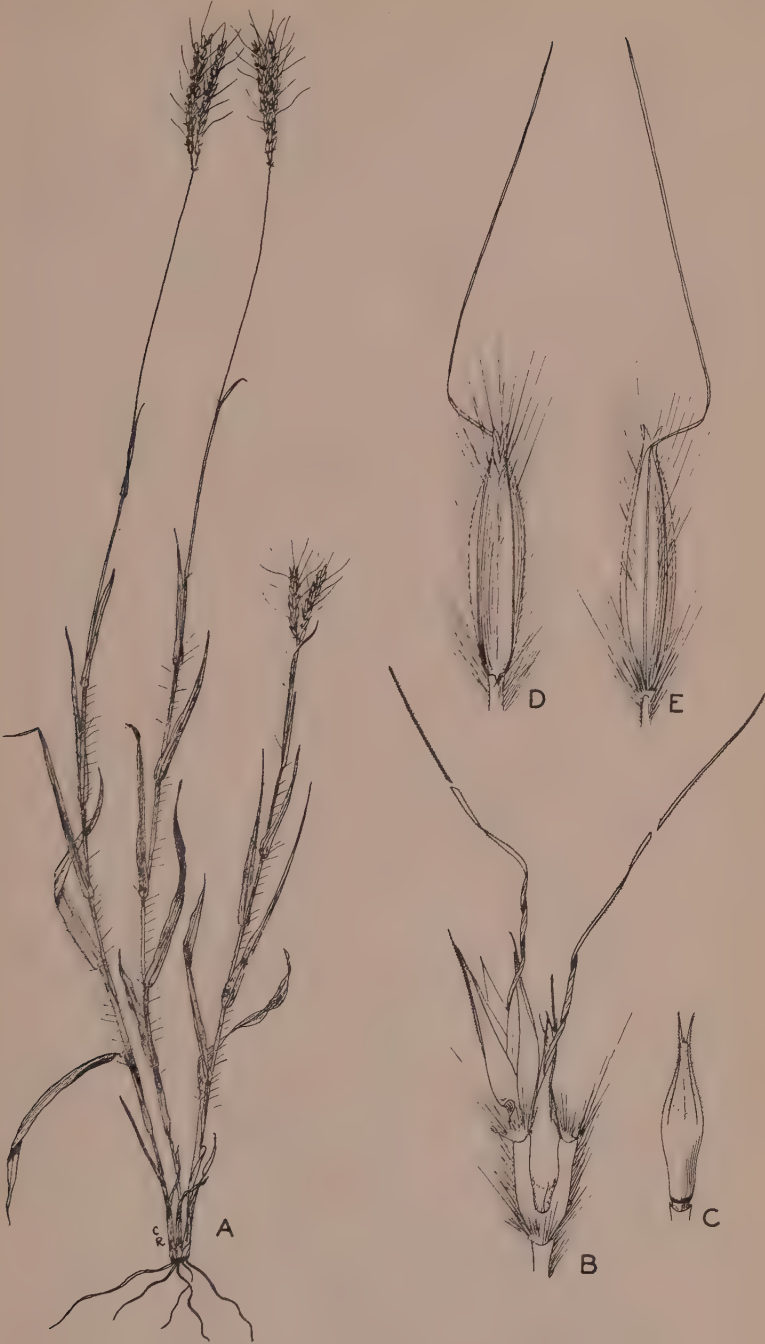




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## STUDIES IN THE THEACEAE, XVII<sup>1</sup> A REVIEW OF THE GENUS BONNETIA

CLARENCE E. KOBUSKI

THE GENUS *Bonnetia* Martius & Zuccarini ex Nees & Martius (1821) of the Theaceae was named for the Swiss naturalist, Charles Bonnet (1720–1793). G. Don (1831) refers to him as a French naturalist who “wrote some botanical papers in 1754.” The Encyclopedia Britannica, however, refers to Bonnet as Swiss, stating that he was born at Geneva of a French family and that he never left Switzerland.

The name *Bonnetia*, as interpreted in this study, was suggested by Rehder as a *nomen conservandum* in the Kew Bull. 1935: 382. 1935, and was adopted as such in 1940 (Kew Bull. 112). In commenting upon the names to be rejected, Rehder pointed out that *Bonnetia* Schreber (1789) belonged to *Mahurea* of the Theaceae and that *Bonnetia* Necker (1790) was a synonym of the scrophulariaceous genus *Buchnera* L. The third synonym, *Kieseria* Nees (1821), although published earlier, was referred to *Bonnetia* in 1824 by Nees and Martius and was not used again by subsequent workers until 1891, when it was revived by O. Kuntze. Since the name *Bonnetia* had been more generally used by most workers than *Kieseria*, Rehder suggested its adoption.

The original publication of *Bonnetia* Martius & Zuccarini ex Nees & Martius is generally thought to have appeared in volume one, fascicle four of Martius & Zuccarini, Nov. Gen. Spec. in 1824. On the title page of this work the date 1824 is recorded. However, B. B. Woodward, in Jour. Bot. 46: 198. 1908, proved conclusively that fascicle four of Martius and Zuccarini's volume wherein *Bonnetia* appeared was not published until 1826.

Nees & Martius [Nov. Acta Phys.-Med. Acad. Leop.-Carol. 12(1): 36. 1824] credited the name *Bonnetia* to Martius and Zuccarini but showed at the same time that the name had not been published. They stated in reference to *Bonnetia* “. . . in Martii Nov. Gen. fasc. 4., mox edendo, probabit D. Zuccarini” which can only be interpreted as of the future, “D. Zuccarini will recommend, soon to be published.” Hence, instead of *Bonnetia* Martius & Zuccarini, the rather cumbersome citation *Bonnetia* Martius & Zuccarini ex Nees & Martius in Nov. Acta Phys.-Med. Acad. Leop.-Carol. 12(1): 36. 1824 must be used.

Up to the present, *Bonnetia anceps* Martius & Zuccarini (1826) has been generally considered the standard species of the genus. However, the

<sup>1</sup> The abbreviations of the herbaria cited in this paper are as follows: AA = Arnold Arboretum of Harvard University; Ch = Chicago Natural History Museum; G = Gray Herbarium of Harvard University; Mo = Missouri Botanical Garden; NY = New York Botanical Garden; US = United States National Museum.

actual type is *Bonnetia stricta* (Nees) Nees & Martius (1824) (*Kieseria stricta* Nees), having received publication two years earlier. As it happens, these two species are considered conspecific in this study. It is with regret that the better known and more descriptive name *B. anceps* is relegated to synonymy under *B. stricta*.

*Bonnetia* Martius & Zuccarini ex Nees & Martius in Nov. Acta Phys.-Med. Acad. Leop.-Carol 12(1): 36, t. 6. 1824.—Martius & Zuccarini, Nov. Gen. Spec. 1: 114. 1826.—Cambessedes in St. Hilaire, Fl. Bras. Merid. 1: 301. 1827.—Sprengel, Syst. Veg. Cur. Post. 4(2): 206. 1827.—Cambessedes in Mém. Mus. Hist. Nat. Paris 16: 409. 1828.—G. Don, Gen. Syst. 1: 570. 1831.—Meisner, Pl. Vasc. Gen. 1: 40, 2: 30. 1836.—Endlicher, Gen. Pl. 1020. 1840.—Walpers, Repert. 1: 373. 1842.—Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 159 (Mém. Ternstr. 71). 1855.—Turczaninow in Bull. Soc. Nat. Moscou 31(1): 246. 1858.—Bentham & Hooker f., Gen. Pl. 1: 187. 1862.—Baillon, Hist. Pl. 4: 259. 1873.—Wawra in Martius, Fl. Bras. 12(1): 323. 1886.—Oliver in Trans. Linn. Soc. Lond. ser. 2, 2: 272, pl. 37B, figs. 9–17. 1887 (ex imThurn in Timehri 5: 190. 1886).—Szyszylowicz in Nat. Pflanzenfam. III, 6: 180. 1893.—Dalla Torre & Harms, Gen. Siphon. 317. 1901.—Huber in Bol. Mus. Goeldi 7: 301. 1913.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 149. 1925.—Lemée, Dict. Pl. Phan. 1: 619. 1929.—Gleason in Bull. Torrey Bot. Club 58: 395. 1931.—Rehder in Kew Bull. 1935: 382. 1935.—Gleason in Brittonia 3: 170. 1939.—Howard in Jour. Arnold Arb. 28: 125. 1947.

*Kieseria* Nees in Flora 4: 298. [May 21] 1821; in [Maximilian] Wied-Neuwied, Reise Brasil. 2: 338. 1821.—Kuntze, Rev. Gen. 1: 62. 1891, "*Kiesera*."—Britton in Bull. Torrey Bot. Club 41: 19. 1914.

Trees or shrubs. Leaves thick-coriaceous, alternate, congested at the apex of the branchlets in dense or loose spirals, usually obovate, rarely lanceolate, sessile or short-petiolate, the margins entire or lightly denticulate near the apex, usually pinninerved. Flowers hermaphroditic, rose, rose and white, or rich yellow, solitary or up to three on axillary peduncles, occasionally arranged in loose panicles; bracteoles when present three to a flower, quickly caducous; sepals 5, rarely more, imbricate, persistent, unequal; petals 5, convolute in the bud, flabelliform, deciduous; stamens very numerous, persistent, the filaments joined at the base, otherwise quite free, the anthers versatile, opening longitudinally or by two pores at the base, often with a rather wide connective; ovary glabrous, usually 3-celled, rarely 4-celled, the ovules very numerous, orderly arranged on thickened placentae, the styles persistent, one or three, when solitary entire or parted at the apex; stigmas one or three depending on the formation of the style, three-lobed when the style is solitary and entire. Fruit capsular, dehiscent septically at the apex, the margins turned inward appearing as dissepiments, the columella apparently persistent; seeds (not seen) linear, elongated above and below into a small membranous wing.

TYPE SPECIES: *Bonnetia stricta* (Nees) Nees & Martius.

#### KEY TO THE SPECIES

A. Styles three, free to the base.

B. Leaves 7–12 cm. long, 2.5–5 cm. wide; anthers oblong, 1.5 mm. long; flowers yellow. ....1. *B. tristyla*.

BB. Leaves minute, 0.8–1.3 cm. long, 0.5–0.6 cm. wide; anthers obcordate, 0.5 mm. long; flowers rose-colored. ....2. *B. roraimae*.



AA. Styles solitary, entire or 3-parted at apex (4-parted in *B. Steyermarkii*).

B. Style entire.

C. Flowers solitary; leaves sessile.

D. Leaves oblanceolate, 10–14 cm. long, 3–4 cm. wide with 100 or more pairs of veins; peduncle and sepals lightly puberulent...3. *B. longifolia*.

DD. Leaves rounded or broadly ovate, 2–5 cm. long, 1.5–3 cm. wide with not more than approximately 10 pairs of veins; peduncle and sepals glabrous.

E. Peduncles minute, ca. 2 mm. long; sepals 8–9 mm. long, 3–4 mm. wide; petals 6.5–8 mm. long, 5–7 mm. wide.....4. *B. tepuiensis*.

EE. Peduncles ca. 15 mm. long; sepals ca. 25 mm. long, 10 mm. wide; petals 45 mm. long, 30–40 mm. wide.....5. *B. crassa*.

CC. Flowers in racemes or subracemes; leaves petiolate.

D. Leaves somewhat oblique, oblong-subelliptic, acute at the apex.....6. *B. holostyla*.

DD. Leaves symmetrical, oblong-lanceolate, obtuse at the apex.....7. *B. venulosa*.

BB. Style 3- or 4-parted at the apex.

C. Style usually 4-parted, occasionally 3-parted, the cells of the ovary varying correspondingly; sepals 10 or 11; corolla a striking yellow.....8. *B. Steyermarkii*.

CC. Style 3-parted, ovary 3-celled; sepals 5; corolla rose-colored or white tinged with rose.

D. Peduncles strongly ancipitous.

E. Pedicel 1–2.5 cm. long; petals 3–3.5 cm. long, 2.5 cm. wide; margin of the leaf lightly denticulate toward the apex. Cuban species.....9. *B. cubensis*.

EE. Pedicel 0.5 cm. long; petals ca. 2.5 cm. long, 2 cm. wide; the margin of the leaf entire. South American species.....10. *B. stricta*.

DD. Peduncles terete.

E. Inflorescence in large, many-flowered open panicles; leaves oblique.....11. *B. paniculata*.

EE. Inflorescence of solitary flowers or in threes, not paniculate; leaves symmetrical.

F. Leaves rounded or obtuse at apex, retuse; bracteoles 3 per flower.

G. Leaves oblong-spathulate, the veins many but forming no conspicuous submarginal veins; petals 2 cm. long, 2 cm. wide at apex.....12. *B. Dinizii*.

GG. Leaves oblong-oblanceolate with conspicuous submarginal veins; petals large, 3–3.5 cm. long, 3 cm. wide at apex.....13. *B. sessilis*.

FF. Leaves linear-lanceolate, very acute at the apex; bracteoles absent.

G. Pedicel, calyx-lobes and parts of the leaves hirsute; veins of the leaves conspicuous, numerous, ca. 20 per cm.....14. *B. duidae*.

GG. Pedicel, calyx-lobes and the leaves glabrous; veins of the leaves inconspicuous, 5–7 pairs.....15. *B. lanceifolia*.

1. *Bonnetia tristyla* Gleason in Bull. Torrey Bot. Club 58: 396. 1931.

Tree 8–10 m. high. Branchlets glabrous, angled in dried state, marked with nearly circular leaf-scars, the internodes longer than in most species. Leaves not as crowded at the apex as in most species, coriaceous, glabrous, slightly oblique, oblong-obovate, 7–12 cm. long, 2.5–5 cm. wide, obtuse at the apex, tapering abruptly at the base into a stout, very short petiole ca. 2 mm. long and wide, deep green above, paler green beneath, the margin crenulate with small, spinulose teeth particularly in the upper indentations, the lateral veins elevated on both surfaces, ca. 12 pairs, arcuately

ascending, anastomosing near the margin. Flowers solitary in the upper axils; peduncles glabrous, 6–8 cm. long, exceeding the smaller upper leaves in length, swelling toward the apex; sepals 5, imbricate, glabrous, unequal, the outer two smaller, broadly elliptic, ca. 1 cm. long, obtuse at the apex, the inner three considerably larger, broadly obovate, ca. 2 cm. long, rounded at the apex; petals 5, yellow, flabelliform, 3 cm. long and ca. 3.5 cm. wide at the apex, tapering gradually from the apex to the base; stamens very numerous, the filaments thread-like, ca. 10 mm. long, joined at the base, otherwise free, the anthers oblong, ca. 1.5 mm. long, deeply lobed at the apex; ovary ovoid, 3-celled, glabrous, the styles 3, 9–10 mm. long, swelling considerably and incurved toward the apex. Fruit not seen.

VENEZUELA: Territorio Federal Amazonas: Summit of Cerro Duida, along valley forest between Central Camp and Brocchinia Hills, alt. 1675 m., *J. A. Steyermark 58108* (Ch), Aug. 31, 1944 (tree 25–30 ft. tall; flowers large, 3–4 inches in diameter, opening in late morning, the petals yellow; leaves deep green above, paler beneath).—Summit of Mt. Duida, hillsides and flat ground at Central Camp, alt. 1600 m., *G. H. H. Tate 536* (TYPE, NY; US), Dec. 20–28, 1928 (large tree).

When this species was first described it was thought to be the first instance of “free styles” in the genus. *Bonnetia roraimae* Benth. is another example of the same style-formation. However, these two species are so far removed from each other that a comparison is unnecessary.

*Steyermark 58108* is a very valuable second collection of this species. This number was collected very close to the type locality and affords added information. The color of the corolla, yellow, is very unusual. This is the first instance of any color other than rose or white appearing in the genus. However, the newly described *B. Steyermarkii* also has yellow petals. Steyermark collected his specimen from a “tree 25–30 feet tall.” Tate refers to his specimen as a large tree, just how large is a matter of conjecture. However, presumably it is considerably larger than 25–30 feet.

Just how strong a character the angled stem may prove to be is hard to decide with only the two specimens for comparison. In the dried state, the stem appears definitely angled. The angled condition is not continuous along the stem but appears to extend from internode to internode. In this it resembles some of the Chinese species of *Eurya*.

The very unequal calyx-lobes furnish another interesting character. The three inner lobes (20 mm.) measure nearly twice as long as the two outer lobes.

2. *Bonnetia roraimae* Oliver in Trans. Linn. Soc. ser. 2, 2: 272, pl. 37B, figs. 9–17. 1887 (ex imThurn in Timehri 5: 190. 1886).—Melchior in Nat. Pflanzenfam. ed. 2, 21: 150. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931; in Brittonia 3: 171. 1939.

Shrub or small tree up to 8 m. high, the trunk as much as 30 cm. diameter. Branches glabrous, verticillate, terete, gray-brown, the branchlets purple-red, the surface often very rough because of the very close succession of leaf-scars. Leaves coriaceous, small, glabrous, congested near the ends of the branchlets in a very close spiral arrangement, oblong-obovate to oblanceolate, 8–13 mm. long, 5–6 mm. wide, broadly acute to obtuse at the apex, tapering at the base into a short petiole less than 1 mm.

long, dark green above, pale yellow- to brown-green beneath, the uppermost leaves tinged with brick or rose, the margin finely denticulate, revolute near the base, the veins obscure on both surfaces. Inflorescence usually a single flower at the apex of the branchlets, rarely two; sepals 5, imbricate, glabrous, subequal, 5–5.5 mm. long, ca. 4 mm. wide, the two outer obtuse at the apex, less rounded than the three inner ones, the margin glandular-denticulate, especially along the edge exposed in the imbricate arrangement; petals 5, pinkish white within, deep rose without, obovate, 6–8 mm. long, 4–5 mm. wide, retuse at the apex, tapering toward the base; stamens very numerous, in series, the filaments glabrous, thread-like, varying in length, the longest 3 mm. long, the shortest filaments on the exterior row, joined only at the extreme base, otherwise free, the anthers obcordate, ca. 0.5 mm. long, 0.5 mm. wide at the apex; ovary ovoid, glabrous, 3-celled, 3 mm. long, 2 mm. diameter, multi-ovulate; styles 3 or 3-parted to the base, glabrous, the stigmas three. Fruit unknown.

BRITISH GUIANA: Mt. Roraima, summit, *G. H. H. Tate* 369 (NY), Nov. 24, 1927.—Roraima, *E. Ule* 8708 (fragment, Ch).

VENEZUELA: State of Bolivar: Summit of Mt. Roraima, on northwest portion north and northwest of Summit Camp, in depressions of morros, alt. 2620–2740 m., *J. A. Steyermark* 58828 (Ch), Sept. 27, 1944 (common shrub 4–8 ft. tall, the stem purple-red; leaves coriaceous, deep green above, brownish green beneath, the uppermost tinged beneath with rose or lavender; petals pinkish white within, deep rose without).—Ptari-tepuí, *Bonnetia roraimae* forest on southwest-facing shoulder, alt. 2000–2200 m., *J. A. Steyermark* 59728 (Ch), Nov. 2, 1944 (shrub to small tree, 4–25 ft. tall, the trunks up to 1 ft. diameter; leaves coriaceous, dark green above, pale green beneath, the uppermost leaves tinged with brick or rose; petals rose-pink with white).—Ptari-tepuí, *Brocchinia-Stegolepis-Heliampora* swamp on southwest-facing shoulder, alt. 2300 m., *J. A. Steyermark* 59791 (Ch), Nov. 2, 1944 (depressed shrub 3 ft. tall).—Summit of Carrao-tepuí, alt. 2470–2500 m., *J. A. Steyermark* 60886, Dec. 7, 1944 (shrub or tree 3–25 ft. tall; leaves dark green above, pale green beneath; petals pink to rose).—Sororopan-tepuí, crest of cerro between east and west end, along streamlet, alt. 2256 m., *J. A. Steyermark* 60144 (Ch), Nov. 14, 1944 (shrub 15–20 ft. tall).—Mt. Auyan-tepuí, alt. 2200 m., *G. H. H. Tate* 1153 (NY, US), Dec. 1937–Jan. 1938.—Mt. Roraima summit, alt. 8700 ft., *A. S. Pinkus* 111 (Ch, G, NY, US), Jan. 9, 1939 (shrub 5 ft. high; corolla red; anthers yellow).

*Bonnetia roraimae* is probably the most distinctive species of the genus and most easily identified. Like so many species confined to Mt. Roraima and the adjacent similarly isolated regions, it presents characteristics very different from other members of the genus. Most noticeable is the comparative smallness of all parts of the plant. The leaves are the smallest found in the genus, measuring up to only 13 mm. long and 6 mm. wide. One specimen, *Steyermark* 60144, has leaves which exceed these measurements (2 cm.  $\times$  0.9 cm.), but these are still very small for the genus. The close spiral arrangement of the leaves, the minute denticulations along the margin, and the absence of visible veins are also excellent characters of distinction. The anthers are distinctly obcordate, a feature which differs from all other previously described anthers.

When Oliver first described the species he referred to the many stamens as being arranged in five "phalanges." The stamens were illustrated just so, with the filaments joined at the base for one-half the distance of the shortest stamens. This same character has been used in various keys by

later botanists to distinguish the species. The stamens, when first observed in a dissection of a bud, appear to occur in clumps or groups. However, close examination fails to show this arrangement. They appear more likely to be arranged in series, the shortest stamens comprising the outer series. The filaments are free to the base. Two open flowers and one bud were examined.

The corolla and calyx are correspondingly small. The margins of the calyx-lobes are glandular-denticulate, especially along the edge exposed in the imbricate arrangement. This character, very common in other genera of this family, is quite rare in *Bonnetia*.

The styles may be classified as 3-parted to the base or as 3 distinct styles. This character is found also in Gleason's species, *B. tristyla*.

3. *Bonnetia longifolia* Gleason in Bull. Torrey Bot. Club 58: 396, 397. 1931.

Large tree. Branchlets leafless except at the apex, terete, glabrous, reddish brown, the cortex smooth, birch-like, sparsely marked with very wide but short leaf-scars. Leaves crowded at the end of the branchlets, coriaceous, glabrous, oblanceolate, somewhat oblique, 10–14 cm. long, 3–4 cm. wide, broadly acute to obtuse at the apex, retuse, tapering from the middle to the base, sessile, the margin entire, many pairs of veins (over 100) elevated on both surfaces, ascending at an angle of  $60^\circ$ , running parallel and straight to the margin without anastomosing until they join in a single close rather inconspicuous submarginal vein. Flowers terminal or axillary ?, at or near the ends of the branchlets; peduncle stout, 2 cm. long, finely puberulent; sepals 5, coriaceous, lightly puberulent on the exterior surface, broadly elliptical, ca. 2 cm. long and 1 cm. wide, rounded at the apex, the margin membranaceous; petals 5, flabelliform, pink, ca. 4 cm. long, about as wide near the apex, tapering to the base; stamens very numerous, the filaments filiform, ca. 10 mm. long, joined at the base, otherwise free, the anthers linear, 5–6 mm. long, ca. 0.5 mm. wide; ovary ovoid, 8 mm. long, 3-celled; style straight and slender, 10 mm. long, entire, the stigma obscurely 3-lobed. Fruit not seen.

VENEZUELA: Summit of Mt. Duida, hillsides and flat ground at Central Camp, alt. 1600 m., *G. H. H. Tate* 537 (TYPE, NY; US), Dec. 20–26, 1928 (large trees; flowers large, pink, the anthers waxy-yellow).

Only a single collection of this species, the type, has been available for this study. Because the flowers are both very few and large, I have made no dissections, but have depended upon the description of Gleason for the parts not easily discernible.

The branchlets are very distinctive, appearing as though they might have been succulent in the fresh state. On the specimen the cortex, which is very smooth and birch-like, seems to have been separated from the inner layers of the stem in drying.

The long leaves are marked by straight parallel veins, more numerous than in most species. These veins rise from the midrib at an angle of  $60^\circ$  and run parallel almost to the very margin without joining in any manner. At the margin they form a single submarginal vein running the length of the leaf very close to the margin itself.

Gleason described the flowers as "3 or 4, terminal." None of the flowers



are attached at present to the stem. Since there is no evidence of any type of inflorescence, it may be possible that the flowers are axillary near the apex. The fine puberulence of the peduncle and sepals is a most unusual character for the genus, appearing also only in *B. duidae* Kobuski & Steyermark.

4. *Bonnetia tepuiensis* Kobuski & Steyermark, sp. nov.

Arbor parva 8–12 m. alta (vel frutex ca. 1 m. altus); trunco 20 cm. diam., cortice griseo-brunneo, sulcato, ramulis verticillatis vel affinis, teretibus, glabris, griseis. Folia coriacea, ad apicem ramulorum conferta, patenti-adscentia, sessilia, glabra, late ovata, 2–2.8 cm. longa, 1.5–1.8 cm. lata, apice obtusa, retusa, basi rotundata, margine minute denticulata, revoluta, costa supra plana subtus elevata, venis ca. 5–6 paribus, undique inconspicuis. Flores axillares solitarii; pedunculis teretibus, glabris, minutis, ca. 2 mm. longis et in diam.; sepalis 5, imbricatis, glabris, lanceolatis, 8–9 mm. longis, 3–4 mm. latis, apice acuminatis ad basim latissimis, margine scariosis; petalis (immaturis) 5, late obovatis, roseo-albis, 6.5–8 mm. longis, apice 5–7 mm. latis, ad basim attenuatis; staminibus numerosis; filamentis filiformibus, liberis basi exceptis, ca. 3 mm. longis; antheris oblongis, ca. 1 mm. longis; ovario ovoideo, glabro, 4 mm. longo, 2.5 mm. diam., 3-loculari, multi-ovulato; stylo integro, glabro, 3-sulcato, 1.5 mm. longo. Fructus non visus.

VENEZUELA: Bolívar: Lower southeastern slope of Carrao-tepui, in woods, alt. 1675–1980 m., *J. A. Steyermark* 60871 (TYPE, Ch), Dec. 5–6, 1944 (tree 20–35 ft., the trunk branched, up to 8 inches diameter, the bark dark gray-brown, furrowed; leaves coriaceous, spreading-ascending, deep green above, dull green beneath, with purple-red or wine-red margin; petals white, tinged with pink at the tips or along the margins).—Summit of Carrao-tepui, in open places or surrounding open places with *B. roraimae*, alt. 2500 m., *J. A. Steyermark* 60902 (Ch), Dec. 7, 1944 (shrub or bush, 3–4 ft.).

This species is most closely related to *B. roraimae* Oliver. Both species have universally small leaves and flowers. In both species the leaves have a tendency, although concentrated at the apices of the branchlets, to terminate the branchlet in a dense rosette. The flowers are nestled, solitary, in this rosette of leaves. The general arrangement of leaves does, however, in both species extend farther down the branchlets than in most other species of the genus.

There are notable differences between the two species. In *B. roraimae* the leaves are the smallest to be found in the genus, measuring only ca. 1 cm. long and about half as wide. The sepals are smaller and more or less rounded with glandular-denticulate margins. The stamens are of varying length with obcordate anthers. The style is 3-parted to the base. In *B. tepuiensis* the leaves are nearly three times as long and rounded at their apices. The sepals are lanceolate rather than rounded and the margins are entire; the anthers are oblong and the style is entire.

According to Steyermark, these two species grow in the same locality on Carrao-tepui.

5. *Bonnetia crassa* Gleason in Bull. Torrey Bot. Club 58: 395, 397. 1931; in Brittonia 3: 170. 1939.

Shrub or tree. Branchlets glabrous, naked except for a few leaves at

the summit, stout, densely marked by leaf-scars, the internodes very short. Leaves coriaceous, sessile, in spirals at the apex of the branchlets, glabrous, obovate, 4–5 cm. long, 2–3 cm. wide, rounded at both apex and base, shining deep rich green above, dull green beneath, the margin entire, ciliate when very young, the veins conspicuous on the upper surface, ca. 10–12 pairs, rising from the midrib at a 45° angle and arching gracefully upward toward the margin joining only near the apex. Flowers solitary; peduncle stout, ca. 1.5 cm. long, glabrous; sepals 5, imbricate, glabrous, oblong, ca. 2.5 cm. long, 1 cm. wide, acute and cuspidate at the apex, the margin entire, scabrous; petals 5, broadly flabelliform, rose to white tinged with pink, 4.5 cm. long, 3–4 cm. wide at the apex, lightly retuse; stamens very numerous, the filaments filiform, joined at the base, otherwise free, ca. 1.5 cm. long, the anthers minute 0.1 cm. long; ovary narrowly ovoid, ca. 7 mm. long, ridged, 3-celled, gradually tapering into a stout, erect, entire style, the stigma 3-lobed. Fruit not seen.

VENEZUELA: Territorio Federal Amazonas: Summit of Mt. Duida, hillsides and flat ground at Central Camp, alt. 1600 m., *G. H. H. Tate* 539 (TYPE, NY; US), Dec. 20–28, 1928 (large tree with pinkish white flowers).—Same locality, slope of Ridge 25, alt. 1800–2000 m., *G. H. H. Tate* 413 (NY), Nov. 26–Dec. 16, 1928 (leaves in whorls of 3; flowers pink with curled petals).—Same locality, Brocchinia Hills, alt. 1700–1800 m., *J. A. Steyermark* 58182 (Ch), Sept. 1, 1944 (shrub 15–25 ft. tall; leaves coriaceous, at tips of branches, deep rich green above, dull green beneath; petals deep rose to white tinged with pink).

This species is most closely related to *B. sessilis* Benth. However, it can be separated from *B. sessilis* by the entire style, the longer, acuminate sepals and larger petals.

Besides the two original specimens studied by Gleason, I had at my disposal an excellently preserved specimen from the type-locality collected by Steyermark. This added material, in beautiful condition, agreed in all respects with Gleason's original well-composed description.

There is considerable variation in the stature of this species. Tate records it as a large tree while Steyermark lists it as a shrub "15–25 ft. tall."

6. *Bonnetia holostyla* Huber in Bot. Mus. Goeldi 7: 301. 1913.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 150. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931.

Small tree. Branchlets glabrous, terete, reddish purple. Leaves somewhat oblique, oblong-subelliptic, glabrous, 6–12 cm. long, 3–4 cm. wide, broadly acute and emarginate at the apex, cuneate at the base, the margin entire, the veins lightly raised on both surfaces, many pairs, rising at an acute angle from the midrib running parallel nearly to the margin then ascending, the petiole ca. 3 mm. long. Inflorescence subracemose, the lower peduncles glabrous, 1–1.5 cm. long, usually 2- or 3-flowered, the upper peduncles usually single-flowered, the pedicels short, ca. 4 mm. long; sepals 5, imbricate, glabrous, ca. 1 cm. long, subrotund at the apex, scarious at the margin; petals 5, flabelliform, emarginate, rose-colored, 15–17 mm. long, ca. 10 mm. wide, widest at the apex, tapering toward the base; stamens very numerous, the filaments thread-like, free, ca. 10 mm. long; ovary conical, tapering in a long style, 14 mm. long, entire its whole length, the stigma broadly 3-lobed.

COLOMBIA: "Hab. in cacumine montis Cupaty ad fl. Yapurá-Caquetá," A. Ducke 12315 (ISOTYPE US; photo Ch, G), Nov. 27, 1912.

This rare species appears to have been collected only once. Fortunately, we were able to examine an isotype deposited in the U. S. National Herbarium. The specimen is rather poor, having been collected with immature fruit. However, the style is clearly entire with a 3-lobed stigma showing no tendency to split.

Another interesting character, not mentioned by the author, is the oblique leaf. This characteristic is not as pronounced as in *B. paniculata* Spruce but is quite obvious, and I am of the opinion that it is with this species that its closest affiliation lies, rather than with *B. sessilis* Benthham as suggested by the author.

7. *Bonnetia venulosa* Martius & Zuccarini, Nov. Gen. Sp. 1: 115. 1826.—Sprengel, Syst. Veg. Cur. Post 4(2): 207. 1827.—G. Don, Gen. Syst. 1: 570. 1831.—Walpers, Repert. Bot. Syst. 1: 373. 1842.—Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 159 (Mém. Ternstr. 71). 1855.—Wawra in Martius, Fl. Bras. 12(1): 325. 1886.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 150. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931.

*Kiesera venulosa* (Mart. & Zucc.) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

*Haemocharis venulosa* (Mart. & Zucc.) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Small tree. Leaves oblong-lanceolate, 7–8 cm. long, ca. 5 cm. wide, obtuse, attenuate at the base into a petiole 6 mm. long, entire, glabrous, the midrib prominent beneath, the veins close, parallel. Flowers terminal, disposed in a composite raceme; calyx-lobes subequal, glabrous, ovate to suborbicular, obtuse at the apex; corolla unknown; stamens very numerous, the filaments irregularly connate at the base, free above, filiform, glabrous, persistent. Capsule conical, the calyx and filaments persistent, attenuated into the style, 3-celled, 3-valved, the valves ovoid, acute, subwoody on the external surface, glabrous, showing dissepiments with thin inturred margins, dehiscing introrsely from the apex, nevertheless joined inter se with the persistent style; the central receptaculum 3-angled, pushing into the locules and placentae with prominent thick angles, connate with the margins of the valves; seeds linear, minute, with crisp membranous brown wings at both the apex and the base.

NO SPECIMENS EXAMINED.

Since no specimens of this species have been available for this study it has been necessary to rely upon the original description of Martius & Zuccarini, a translation of which is given above. Wawra in his work for Martius' Flora Brasiliensis did not see the type-specimen, or any specimen for that matter. This seems puzzling considering the fact that the species was described by Martius and Zuccarini.

It may be that the specimen had been placed in another genus before Wawra worked on the family. The description seems to apply well to *Bonnetia*. However, no description of the corolla was made by Martius and Zuccarini. It is possible that it may belong to *Mahurea* of the Guttiferae, but this is merely an assumption on my part. Until it can be shown with certainty that it belongs elsewhere, I feel that I should accept it, as have other workers before me.

8. *Bonnetia Steyermarkii* Kobuski, sp. nov.

Frutex 5–8 m. altus; ramulis glabris, griseo-brunneis. Folia coriacea, glabra, elliptica vel elliptico-ovata, sessilia vel subsessilia, 7–9 cm. longa, 3–4 cm. lata, supra atro-viridia, subtus luteo-viridia vel rosea, apice obtusa vel subrotundata, basi rotundata, margine minute denticulata juventute ciliata, costa glabra basi expansa, supra plana, subtus elevata, nervis ca. 12 paribus, undique elevatis, arcuato-adscentibus margine anastomosantibus. Flores apice ramulorum, axillares, solitarii; pedunculis crassis, ancipitibus, glabris, 3–5 cm. longis, ad 5 mm. latis, apice accrescentibus, alatis, alis 1 mm. latis; sepalis imbricatis, ca. 11, subaequalibus, glabris, ovato-lanceolatis, apice apiculatis, ca. 1.7 cm. longis, 0.6–0.7 cm. latis, sepalis interioribus latioribus; petalis 5, luteis, flabelliformibus, 3.5 cm. longis, 2.7 cm. latis; staminibus plurimis; filamentis filiformibus, glabris, 7 mm. longis, liberis basi exceptis; antheris suborbicularibus, ca. 1 mm. longis; ovario ovoideo 3- vel 4-loculari, glabro, multi-ovulato, stylo glabro, 7–8 mm. longo, 3- vel 4-partito, apice ca. 3 mm. diviso, stigmatibus 3 vel 4. Fructus non visus.

VENEZUELA: State of Bolivar: Ptari-tepuí, on densely forested steep south-facing slopes overlying sandstone, between "Cave Rock" and base of high sandstone bluffs, alt. 2285–2400 m., *J. A. Steyermark 59570* (TYPE, Ch), Oct. 30, 1944 (common shrub 15–25 ft. tall, forming impenetrable thickets with curving matted intertwining stems; leaves deep green or bronze above, dull paler green beneath or suffused with rose or lavender especially on the youngest leaves, the margins purplish red; sepals pale green with rose-red margins or suffused with rose-red; petals rich yellow).—Ptari-tepuí, *Bonnetia roraimae* forest on southwest-facing shoulder, alt. 2000–2200 m., *J. A. Steyermark 59794* (Ch), Nov. 2, 1944 (common; leaves deep green above, dull green beneath; petals rich yellow).—Auyan-tepuí, alt. 2200 m., *G. H. H. Tate 1165* (NY), Dec. 1937.

This remarkable species has been recorded from both Ptari-tepuí and Auyan-tepuí, and the field notes of *Tate 1165* state that it also grows on Mt. Duida.

In the broad thick leaves, stems, and large flowers it resembles *B. crassa* Gleason. However, in *B. crassa* the ovary is always 3-celled, the style entire, the sepals 5 in number, the stigma 3-lobed, and the corolla larger and red or rose in color.

*Bonnetia Steyermarkii* is different from all other species in the increased number of sepals, the 4-celled ovary, and the 4-parted style. The sepals are double the number usually found in the rest of the genus. Careful dissection shows at least two rows of sepals with little variation, the outer sepals, perhaps, somewhat more narrow than the inner sepals. In all dissections the ovary proved to be 4-celled and the style 4-parted. The division of the style, in future collections, may prove to be even greater. If the flowers are softened by boiling, one can easily separate the styles to the base. This is not the case in other species. One style, in the specimen of *B. Steyermarkii* examined, appeared to be 3-parted. No dissection of this style (and ovary) was made because of the paucity of material. However, in his notes Steyermark refers to "3–4 styles free for 2.5 mm. above."

This is the second species with yellow petals, the other species being



*B. tristyla* Gleason. The collector refers to this color as rich yellow, so one cannot confuse it with white. In most other species rose or pink appear dominant with white and rose also recorded.

It is with pleasure that I name this distinctive species in honor of Dr. Julian A. Steyermark, who collected three of the new species described in this paper. His excellent material of other species in the genus has aided considerably in this study.

9. *Bonnetia cubensis* (Britton) Howard in Jour. Arnold Arb. 28: 125. 1947.

*Kieseria cubensis* Britton in Bull. Torrey Bot. Club 41: 19. 1914.

Large tree; branchlets stout, reddish brown, glabrous, terete, often very wrinkled when dry. Leaves coriaceous, glabrous, oblong-obovate, 6–11 cm. long, 2.5–3 cm. wide, obtuse or rounded at the apex, long-tapering at the base, sessile or subsessile, the upper surface of the young leaves covered with a grayish bloom, the margin lightly denticulate toward the apex, the midrib plane above, elevated beneath, the veins conspicuous above, ca. 20 pairs, rising from the midrib at an acute angle, extending parallel toward the margin, presently arcuate-ascending. Flowers solitary, in the axils of the uppermost leaves; peduncles glabrous, stout, ancipital, 3–5 cm. long, with as many as 4 bracts at the apex, the bracts obovate, glabrous, sessile, 11–13 mm. long, 6–7 mm. wide, obtuse or rounded at the apex, sessile, lightly denticulate at the apex, the pedicel stout, subterete, 1–2.5 cm. long; sepals 5, imbricate, persistent, glabrous, unequal, the outer sepals broadly ovate, ca. 1.5 cm. long and 1 cm. wide, the inner sepals subrotund, ca. 2 cm. long and 1.5 cm. wide, the scarious margin more extensive on the inner sepals up to 5 mm. wide, lightly denticulate toward the apex; petals 5, rose, glabrous, broadly flabelliform, 3–3.5 cm. long, ca. 2.5 cm. wide; stamens very many, the filaments glabrous, filiform, unequal, ca. 10 mm. long, joined at the base, otherwise free, the anthers globular, ca. 1.5 mm. long and 1 mm. wide; ovary subconical, glabrous, ca. 5 mm. long, 3-celled, multi-ovulate, tapering at the apex into a glabrous, 3-parted style, ca. 8 mm. long, the stigmas 3. Capsule ca. 1.5 cm. long, 3-celled.

CUBA: Oriente: Moa: Vicinity west of Camp San Benito, alt. 900 m., *J. A. Shafer* 4066 (NY, US), Feb. 24, 1910 (tree 20–40 ft., the largest tree in this region).—Camp La Gloria, across Sierra Moa to Moa Bay, *J. A. Shafer* 8283 (Ch, NY, US), Dec. 31, 1910–Jan. 1, 1911 (tree 20 ft., much branched).—Camp La Gloria, south of Sierra Moa, *J. A. Shafer* 8121 (NY, TYPE; Mo), Dec. 24–30, 1910 (tree up to 40 ft. high; capsules dry).—Punta Gorda River, near the bridge close to the sea, *Marie Victorin, Clément, & Alain* 21436 (G), Apr. 16–23, 1943 (large tree in the semi-deciduous forest).—15 km. southwest of Companie de Moa mills, in dense woods, *R. A. Howard* 5842 (G), July 26, 1941 (tree 15 ft. high; flowers pink).

The presence of this species in Cuba is baffling. It appears to be confined to the small Moa area in Oriente, Cuba, since it has not been recorded from any other area of Cuba or the West Indies. Furthermore, it is the only species of *Bonnetia* found outside of South America.

This species has not been included in any previous treatment of the genus and it was not until 1947 that Howard transferred the species from *Kieseria* to *Bonnetia*.

Up to the present treatment, the flowers of this species had not been described. Dissections made from the flowers of *Howard* 5842 furnished

the data in the above description. There is a very close relationship between this species and *B. stricta* Nees & Martius from Brazil. *Bonnetia cubensis* can be separated from the latter species by the length of the pedicel (1–2.5 cm. long) and petals (3–3.5 cm. long, 2.5 cm. wide) and the lightly denticulate margin on the leaves. In *B. stricta* the pedicel measures ca. 0.5 cm. and the petals 2.5 cm. in length. The margin of the leaves is entire. The greatest difference is the area of distribution of the two species, *B. cubensis* being confined to a small area in Cuba, and *B. stricta* in Brazil.

10. *Bonnetia stricta* (Nees) Nees & Martius in Nov. Acta Phys.-Med. Acad. Leop.-Carol. 12: 37, t. 6. 1824.—G. Don, Gen. Syst. 1: 570. 1831.—Walpers, Repert. Bot. Syst. 1: 373. 1842.—Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 159 (Mém. Ternstr. 71). 1855.—Wawra in Martius, Fl. Bras. 12(1): 324. 1886.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 150. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931.

*Kieseria stricta* Nees in Wied-Newied, Reise Bras. 2: 338. 1821.

*Bonnetia anceps* Martius & Zuccarini, Nov. Gen. Sp. 1: 115. 1826.—Cambessedes in St.-Hilaire, Fl. Bras. Merid. 1: 302. 1827.—Sprengel, Syst. Veg. Cur. Post 4(2): 207. 1827.—G. Don, Gen. Syst. 1: 570. 1831.—Spach, Hist. Nat. Veg. 4: 76. 1835.—Walpers, Repert. Bot. Syst. 1: 373. 1842.—Schnitzlein, Iconogr. 3: t. 215. 1852.—Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 159 (Mém. Ternstr. 71). 1855.—Baillon, Hist. Pl. 4: 236. 1873.—Wawra in Martius, Fl. Bras. 12(1): 326, pl. 67, fig. 3. 1886.—Szyzylowicz in Nat. Pflanzenfam. III. 6: 181. 1893.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 149, fig. 66A. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931.

*Bonnetia bahiensis* Turczaninow in Bull. Soc. Nat. Moscou 31: 246. 1858.

*Bonnetia anceps typica* Wawra in Martius, Fl. Bras. 12(1): 326. 1886.

*Kielmeyera bracteosa* Martius ex Wawra in Martius, Fl. Bras. 12(1): 326. 1886, in synon.

*Bonnetia anceps* vars.  $\alpha$  and  $\beta$  Wawra in Martius, Fl. Bras. 12(1): 326. 1886.

*Kielmeyera Schottii* Pohl ex Wawra in Martius, Fl. Bras. 12(1): 326. 1886, in synon.

*Haemocharis stricta* (Nees) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

*Kieseria anceps* (Mart. & Zucc.) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

*Haemocharis anceps* (Mart. & Zucc.) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Shrub or small tree 3–5 m. high, the branchlets thick, glabrous, terete, leafless except at or toward the apex, conspicuously dotted by the large leaf-scars, purple-brown, the cortex shriveled in the dried state, obviously succulent in fresh material, often glaucous near the apex. Leaves coriaceous (drying as though succulent in fresh state) oblong-obovate, 7–14 cm. long, 3–5 cm. wide, obtuse to rounded at the apex, long-attenuate or sessile at the base, glabrous on both surfaces, reddish purple and glaucous above, yellow-green beneath with the midrib and occasionally other portions reddish, the margin entire, subrevolute (when dried), the midrib flat or slightly canaliculate above, raised beneath, the veins up to ca. 20 pairs, closely arranged, somewhat parallel, ascending at an abrupt angle toward the margin then arching upward along the margin toward the apex. Inflorescence axillary, the peduncle ancipitous, glabrous, 2–4 cm. long (occasionally up to 6 cm. long), usually one-flowered, occasionally three-flowered, accrescent toward the apex, the pedicels (when present) short, up to 5 mm. long; bracteoles 3, subsepaloid, somewhat rounded, the middle one more elongate, ca. 6–9 mm. long; sepals 5, imbricate, coriaceous,

glabrous, persistent, unequal, the outer two thicker, more nearly rounded, ca. 12 mm. long, the inner three more elongate, thinner, the margins entire, scarious especially on the inner sepals; petals 5, glabrous on both surfaces, rose-colored or white with rose, obcordate, up to 2.5 cm. long, ca. 2 cm. wide at the apex, emarginate, tapering quite abruptly to the base (ca. 0.5 cm. wide); stamens very numerous, about one-half the length of the corolla, the filaments filiform, joined at the base, otherwise free, the anthers oblong, ca. 1 mm. long; ovary conical, ca. 4 mm. long, 2.5–3 mm. thick at base, glabrous, 3-celled, multi-ovulate, tapering into a short style approximating the ovary in length, three-parted at the apex. Fruit (according to other authors) ovoid, 1–1.5 cm. long, 3-celled, many-seeded.

BRAZIL: Rio de Janeiro: In sandy swamps near Rio de Janeiro, *H. Schott* 1605 (G). Bahia: Igreja Velha, *J. S. Blanchet* 3363 (ISOTYPE of *B. bahiensis* Turcz., AA, Ch), 1841; exact locality missing *J. S. Blanchet* 1416 (Ch), 1700 (Ch), 1834. Locality lacking *H. Schott* ?281 (Ch).

For the past 80 years, *Bonnetia stricta* has been encountered only in keys, never in collections. The main reason is because of the misinterpretation of Wawra, in his treatment of the genus in Martius, Fl. Bras. Wawra separated this species from all others in the group by the "membranaceous" leaves. Considering the heavy texture of the leaves I have encountered in species of the genus, I doubt if any species has been found or will be found with this type of foliage.

In 1821, when the species was first mentioned under the new genus *Kieseria* by Nees, a German description signified: a shrub 8–10 ft. high, with long, cuneate, blunt entire-margined juicy-coriaceous leaves and large white flowers which appear in twos, each one provided with three bracts at the base, and stand on short peduncles in the axis of the upper leaves. Nees used the word "saftiglederartigen" to describe the leaves in his German description. The only translation that could be used is "juicy-leathery," a far cry from membranaceous.

Later, in the same year, a latin description appeared, as follows: "... *Kieseria stricta* des Herrn Prof. Nees v. Esenbeck: Classis Linneana Polyandria Polygynia; Fam. Nat. Guttiferarum. Corolla penta petala, petalis integris. Calyx quinque-partitus, bracteatus. Antherae erectae liberae. Germen trilobulare, septis simplicibus, loculis monospermis." This description now applied to the species *Kieseria stricta* is the same as the original generic description except for a few transpositions of phrases. It should be noted that in this description the filaments are described as "liberis" or free.

In 1824, three years later, Nees and Martius transferred the species to the new genus *Bonnetia* and presented a much more complete Latin description. Accompanying the description is a plate. In the description the leaves are described as carnosose-coriaceous, and the plate carries this out. The filaments, recorded as free in the original description, are not mentioned here. However, the plate distinctly shows them as free.

In 1827, Sprengel, recognizing the close relationship between *B. stricta* and the latter, described *B. anceps* and combined the two under the more recent name. Walpers, in 1842, again recognized both *B. stricta* and *B.*

*anceps*. His descriptions of the two were identical except that he mentioned the filaments of *B. anceps* as free. Since he did not mention the filaments of *B. stricta* there was no basis for comparison, and according to the illustration of *B. stricta* and a statement in the original description, the filaments are free.

Choisy, in 1855, recognized both species and noted that the peduncles of *B. stricta* were shorter and closer together than those of *B. anceps*. He mentioned that the two species could be separated only with difficulty. In closing he reminded the reader that Sprengel had united the two species and finally suggested that perhaps he (Sprengel) was right!

The first complete treatment of the genus was made by Wawra de Ternsee for Martius' Fl. Bras. in 1886. In this work, *B. stricta* was separated from all other species of the genus by a statement in the key that the leaves were membranous. In his description which followed, the earlier statement was tempered by a reference to the leaves as submembranaceous. Just what Wawra had before him or in mind is difficult to understand. Nees clearly described the leaves as "juicy-coriaceous" in his original German text, and later Nees and Martius, in transferring the species to *Bonnetia*, used the term coriaceous. Perhaps Wawra did not see a specimen of *B. stricta*. Melchior (1925), in his treatment of the Theaceae in the second edition of Nat. Pflanzenfam., followed the work of Wawra and separated *B. stricta* from the other members of the genus on the character of membranous leaves. This same character was used by Gleason (1931), who stated, however, that his key was merely an amplification of Melchior's key to show where his three new species described from Venezuela would fit in Melchior's interpretation.

Wawra, in the diagnostic portion of his description of *B. stricta*, stated clearly that the filaments were free. Later, on the same page, he again referred to the filaments, this time stating that they were joined at the base in fascicles. Both Melchior and Gleason used the latter reference to the filaments, rather than the former, in their respective keys.

Remove the differences in filaments and leaf-texture, and the only variation between the two species so far recorded in literature is the length of the peduncle as cited by Choisy. The illustration of Nees and Martius shows the peduncles to be shorter than those in mature herbarium specimens labeled *B. anceps*, true enough. But the illustration depicts, for the most part, only buds or undeveloped inflorescences. Several specimens cited above, and previously interpreted as *B. anceps* by Wawra, in bud possess short peduncles. Mature flowering specimens exhibit peduncles up to 5 cm. or more. The closeness of the type-localities of the two species along with the fact that *B. stricta* has not been collected, as such, since Martius' treatment, should arouse anyone's suspicions as to whether or not they represent separate entities.

11. *Bonnetia paniculata* Spruce ex Benth. in Jour. Linn. Soc. 5: 63. 1861.—Wawra in Martius, Fl. Bras. 12(1): 325. 1886.—Oliver in Trans. Linn. Soc. ser. 2, 2: 271. 1887.—Szysylowicz in Nat. Pflanzenfam. III. 6: 181. 1895.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 149, fig. 66 B-D. 1925.—Gleason in Bull. Torrey Bot. Club. 58: 397. 1931.



*Bonnetia parviflora* Spruce ex Benth in Jour. Linn. Soc. 5: 63. 1861.

*Bonnetia paniculata typica* Wawra in Martius, Fl. Bras. 12(1): 325. 1886.

*Bonnetia paniculata* Spruce ex Benth. var. *parviflora* (Spruce ex Benth.) Wawra in Martius, Fl. Bras. 12(1): 325, pl. 67. 1866.

*Kiesera paniculata* (Spruce ex Benth.) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Small tree 5–10 m. high with rough bark. Branchlets terete (striate in the dried state), glabrous, reddish purple, the leaf-scars as much as 3 cm. apart. Leaves coriaceous, glabrous, oblique, oblong-obovate, 8–12 cm. long, (2.5–)3–5 cm. wide, usually rounded or obtuse at the apex, acute in the narrower leaves, long-attenuate at the base, deep green above, dull rich green beneath, the margin entire, the veins many, close, conspicuous on both surfaces, rising sharply from the midrib and ascending parallel to the margin, the petiole 5 mm. long. Inflorescence laxly paniculate, each penduncle in the axil of a miniature leaf which is quickly caducous giving the appearance of a leafless panicle; peduncles glabrous, brownish red, compressed, branched or unbranched, usually three-flowered, the lower peduncles longest, up to 5 cm. long, gradually decreasing in length toward the apex, appearing pyramidal; pedicels 5–10 mm. long, angled, usually in threes, the bracteoles quickly caducous, the scars or vestiges evident; sepals 5, coriaceous, dull green tinged with red, somewhat rounded-elliptic, ca. 1 cm. long, 6–7 mm. wide, the margin entire, subscarious, the inner sepals larger; petals 5, emarginate, up to 2 cm. long, ca. 1.5 cm. wide at the apex tapering abruptly to base, white or white tinged with pink or rose; stamens many, the filaments thread-like, joined at the base, otherwise free, glabrous, 8–10 mm. long, the anthers minute, ca. 1 mm. long; ovary conical, glabrous, ca. 3–4 mm. diam. tapering at the apex into a style which is 3-parted at the apex, ca. 8–9 mm. long, sometimes shorter. Capsule (including style) ca. 2 cm. long.

PERU: Dept. San Martín: Near Tarapoto, *R. Spruce* 4809 (ISOTYPES Ch, G, NY), 1855–56.—Near Tarapoto, *R. Spruce* 4239 (ISOTYPES of *B. parviflora*, Ch, G, NY), 1855–56.—Tarapoto, alt. 750 m., *L. Williams* 5955 (Ch, US), 5974 (Ch, US), Dec. 1929.—San Roque, alt. 1350–1500 m., *L. Williams* 7674 (AA, Ch, US), Feb. 4, 1930.—Zepelacio, near Moyobamba, mountain forest, alt. 1200–1600 m., *G. Klug* 3450 (AA, Ch, G, Mo, NY, US), Dec. 1933 (tree 5 m. high with bright rose flowers).

VENEZUELA: Terr. Amazonas: Aguita, slopes of Mt. Duida, alt. 1300 m., *G. H. H. Tate* 928 (NY), Aug. 1928–Apr. 1929 (flowers large red-pink). Bolívar: Gran Sabana, between Mission of Santa Teresita de Kavanayén northwest to Río Karuai, on border of steep woods bordering savanna, alt. 1220 m., *J. A. Steyermark* 59379 (Ch), Oct. 26, 1944 (tree 10 m. tall; leaves coriaceous, deep green above, dull rich green beneath; sepals dull green tinged with brownish brick, as are the peduncles and pedicels; petals white or white tinged with pink).—Wooded slopes of Quebrada O-paru-má, between Santa Teresita de Kavanayén and Río Pacairao (tributary of Río Mouak), upper drier part of forest below mesa, alt. 1065–1220 m., *J. A. Steyermark* 60356 (Ch), Nov. 20–21, 1944 (small tree 10 m. tall with coriaceous leaves deep green above, dull green beneath).

BRAZIL: Amazonas: "Rio Curicuriary (affl. Rio Negro) ad ripas cataractae Cajú, 'catinga,'" *A. Ducke* 345 (AA, Ch, Mo, NY, US), Nov. 18, 1936 (small tree with white flowers).—"Rio Curicuriary affl. Rio Negro super, ad ripam saxosam cataractae Cajú," *A. Ducke* 23741 (US), Oct. 20, 1932 (small tree with white flowers).

BRITISH GUIANA: Region of Mt. Roraima, "Our House," alt. 1900 m., *E. F. imThurn* 135 (US), Dec. 9, 1884.

As the specific name indicates, this species is chiefly characterized by

the panicate inflorescence. The panicles are large and spreading, pyramidal in shape with the lower peduncles longest and those above increasingly shorter. This inflorescence has often been described as a leafless panicle. Although it usually appears leafless, each peduncle arises from the axil of a leaf which is quickly caducous even in the early flowering stage. The flowering leaves, like the peduncles, decrease in size as they near the apex of the inflorescence. Occasional leaves may be seen in the inflorescence. If not present, a leaf-scar remains to show its erstwhile presence.

The oblique leaves present another consistent character. One-half of the leaf forms a nearly perfect arc. The difference in size and shape appears to depend upon the amount of variation in the outline of the opposite half of the leaf. When the "bulge" is greatest, the apex appears subrotund or obtuse; in the leaves with the least variation the apex may appear nearly acuminate.

The leaves are not crowded at the apex as in some of the other species. Like *B. sessilis* the distance between the internodes is greater and the leaves extend farther down the branchlet.

A very close relative is *B. holostyla* Huber. The only real variation in *B. holostyla*, as the name indicates, is the entire style. The leaves in the latter species are oblique but not as prominently so.

The style in *B. paniculata* is strongly 3-parted at the apex. However, I have studied flowers in which the style was not 3-parted at the stage examined, but possessing three lines at the apex showing that eventually the style would probably separate into three parts.

In describing *B. paniculata*, Spruce at the same time described *B. parviflora* from the same region in Peru. The flowers and leaves of Spruce 4239 are smaller than those found in most specimens. However, there is such great variation in both parts as to make the specific status of *B. parviflora* untenable. I do not feel that it can be retained even as a variety as proposed by Wawra in Martius' Flora Brasiliensis.

This is the most widely distributed species as far as present collections are concerned, extending from Peru through Brazilian Amazonas and Venezuela into British Guiana.

12. *Bonnetia Dinizii* Huber in Bol. Mus. Goeldi 7: 302. 1913, in adnot.—Melchior in Nat. Pflanzenfam., ed. 2, 21: 150. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931.

Small graceful tree (fide Ducke). Branchlets roughened by close arrangement of leaf-scars, glabrous, somewhat reddish. Leaves coriaceous, glabrous, somewhat concentrated at the apex of the branchlets, more distant on flowering branchlets, oblong-spathulate, 6–10 cm. long, 2–2.5 cm. wide, obtuse or rounded at the lightly retuse apex, long-attenuate at the base, subsessile (the petiole 2–3 mm. long), the margin finely denticulate, the veins many pairs, slightly elevated on both surfaces, rising from the midrib at an acute angle, extending parallel toward the margin and then sweeping upward. Inflorescence axillary, single- or three-flowered, the peduncles glabrous, up to 3 mm. long; pedicels very short, ca. 3 mm. long;

bracteoles 3 to a flower, quickly caducous, 9 in a verticillate arrangement at the base of the pedicels when three-flowered, at different intervals along the peduncle when one-flowered, glabrous, foliaceous in shape and texture, spatulate, 10–12 mm. long, ca. 4 mm. wide, the margin most minutely denticulate; sepals coriaceous, imbricate, glabrous, unequal, the outer two ovate,  $10 \times 6$  mm., the inner three more rotund, the margin entire, scarious, more so on the inner sepals; petals 5, rose-colored, variously obcordate, 2–2.2 cm. long, ca. 2 cm. wide, retuse or emarginate at the apex, tapering toward a narrow base; ovary conical, glabrous, ca. 3 mm. across, tapering at the apex into a stout glabrous style 10 mm. long, strongly 3-parted for 3 or more mm. at the apex, a line of demarcation extending from the point of division down the length of the style to the base of the ovary. Capsule ca. 1 cm. long.

BRAZIL: Pará: "Hab. in campis ad fl. Ariramba Guianae brasiliensis," A. Ducke 8094 (photo of type, Ch, G), Nov. 23, 1906 (small graceful tree with rose-colored flowers).—"Campos de l'Ariramba (Trombetas)," A. Ducke 11298 (US; photo Ch), Dec. 2, 1910.

It may be that *B. Dinizii* is very localized. Very little material was available for this study, only two specimens, both collected by Ducke in the same locality. A photograph of the type shows that the original collection was very sparse and Huber's description was equally scanty. The above description of the flower was drawn from Ducke 11298, the second collection, and this was made from a single dissection.

Interesting characters worthy of notation are: (1) the stout style, strongly 3-parted at the apex, with a line or depression extending the entire length of the style and the ovary, showing clearly the eventual line of dehiscence; (2) the spatulate leaves, finely denticulate along the margin; and (3) the foliaceous bracteoles, three to a flower, arranged in a whorl in the 3-flowered inflorescences, or along the peduncle in the single-flowered inflorescences.

*Bonnetia paniculata* is the closest relative. It can be separated from the above species by the entire, oblique leaves, and the large, open, paniculate inflorescence.

13. *Bonnetia sessilis* Bentham in Hooker, Lond. Jour. Bot. 2: 363. 1843.—Walpers, Repert. Bot. Syst. 2: 801. 1843.—Schomburgk, Versuch Fauna Fl. Brit.-Guiana 1093. 1848.—Choisy in Mém. Soc. Phys. Hist. Nat. Genève 14: 160 (Mém. Ternstr. 72). 1855.—Wawra in Martius, Fl. Bras. 12(1): 327, pl. 67, fig. 1. 1886.—Oliver in Trans. Linn. Soc. ser. 2, 2: 271. 1887.—Szyszylowicz in Nat. Pflanzenfam. III. 6: 181. 1893.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 150. 1925.—Gleason in Bull. Torrey Bot. Club 58: 397. 1931.

*Kiesera sessilis* (Benth.) O. Kuntze, Rev. Gen. Pl. 1: 62. 1891.

*Bonnetia Phelpsii* Gleason in Brittonia 3: 170. 1939.

Shrub or small tree up to 4 m. high. Branchlets glabrous, stout, brown-purple when very young, becoming gray, striate (probably in drying), the leaf-scars rather inconspicuous and as much as 1 cm. distant. Leaves coriaceous, glabrous, extending along the branch, elliptic to oblong-ob lanceolate, varying in size, usually up to 6 cm. long and 3 cm. wide, occasionally up to 10 cm. long and 4 cm. wide, deep green above, dull green beneath, obtuse and emarginate at the apex, broadly cuneate at the

base, sessile, the margin entire, the veins elevated on the upper surface, subparallel and close, curved ascending, anastomosing near the margin into a conspicuous connecting vein, with a single additional marginal unbranched vein extending from the base to near the apex between the anastomosed margin vein and the margin. Flowers solitary in the axils of the upper leaves, the pedicel stout, reddish purple, glabrous, ca. 1 cm. long; bracteoles apparently 3, foliaceous, oblong-obovate, ca. 12 mm. long and 6 mm. wide, glabrous, rounded at the apex; sepals 5, imbricate, glabrous, coriaceous, the two outer smaller, 11–12 mm. long, nearly as wide, the inner three larger, up to 17 mm. long and 12 mm. wide; petals 5, white with rose or pink tips, triangular-obovate, conspicuously retuse, 3–3.5 cm. long, nearly as wide at the apex, tapering abruptly from the middle to the base; stamens very numerous, the filaments filiform, 8–11 mm. long, free except at the base, the anthers oblong, ca. 1.5–2.0 mm. long; ovary conical, 3-celled, about 3 mm. diameter, glabrous, tapering gradually at the apex into a stout style, a centimeter or more long, 3-parted at the apex, the stigmas 3.

BRITISH GUIANA: Between Ireng and Cotinga rivers, Roraima region, on high stony ground, alt. 900 m., *E. F. imThurn* 11 (US), Oct. 1884–Jan. 1885.—Roraima, *R. Schomburgk* 636 (Ch), 1842–43.—Kaieteur Savanna, (occasional tree 4 m. high, 6 cm. diam., flowers white) *B. Maguire & D. B. Fanshawe* 23258 (A, NY), May 6, 1944.

VENEZUELA: State of Bolivar: Gran Sabana, between mission of Santa Teresita de Kavanayén northwest to Río Karuai, dry sandy and rocky open thickets on large mesa, alt. 1220 m., *J. A. Steyermark* 59340 (Ch), Oct. 26, 1944 (common shrub 1–2 m. tall with coriaceous leaves, deep green above, dull green beneath, the inner sepals yellow-green with dull rose margins, the outer sepals dull green with rose-purple margins, the petals white with pink or pale rose around the tip).—Vicinity of "Misia Kathy Camp," on mesa between Ptari-tepuí and Sororopán-tepuí, alt. 1615 m., *J. A. Steyermark* 60232 (Ch), Nov. 15–17, 1944 (common and dominant, the petals white with pink at tip).—Rocky savanna bordering Río Karuai, between La Laja and Santa Teresita de Kavanayén, alt. 1220 m., *J. A. Steyermark* 60821 (Ch), Nov. 30, 1944 (dominant shrub 1–2 m. tall with white petals with pink or rose tip).—Mt. Auyan-tepuí, rocky savanna on burned mountain, alt. 1500 m., *F. Cardona* 65 (US), May 21, 1937.—Mt. Auyan-tepuí, Guayana, rocky and humid savanna, alt. 1000–1200 m., *F. Cardona* 218 (US), Sept. 1937.—Mt. Auyan-tepuí, alt. 1100 m., *G. H. H. Tate* 1158 (NY, TYPE of *B. Phelpsii*), Dec. 7, 1937.—Mt. Auyan-tepuí, alt. 1850 m., *G. H. H. Tate* 1162 (NY), Jan. 1938.—Cerro Guaquinima, Alto Río Paragua, Guayana, alt. 1760 m., *F. Cardona* 1118 (US), July 15, 1944 (shrub 3 m. high).

The venation of the leaves in this species constitutes one of the outstanding characters of distinction and is quite consistent. Along the margin, more evident on the upper surface, are what appear to be two pairs of submarginal veins. The exterior pair of veins is the lighter of the two pairs and originates near the base of the leaf, extending upward and continuing without branching for the whole length of the leaf, occasionally fading out somewhat, near the apex. The inner pair is formed by the anastomosing of all the remaining major veins in the leaf near the margin and extending upward toward the apex. Gleason in describing *B. Phelpsii* drew attention to this excellent character. The leaves of the type of *B. Phelpsii* are larger than those found on the earlier known speci-



mens of *B. sessilis*, but with the addition of the excellent material of Steyermark this character ceases to be of importance, since both large and smaller leaves are found on the same specimen.

Most workers have considered the style in *B. sessilis* as entire. Wawra seems to have been the first to mention the style and he called it entire. Melchior and Gleason both used the entire style as a feature of distinction in their keys. In all the material studied above, none was found in which the style was entire. If such were the case, one would expect a three-lobed stigma rather than three distinct stigmas, as the case happens to be. The style is split only briefly at the apex but must be termed 3-parted rather than entire.

I have included the bracts in my description above. I presume these are quickly caducous, since they are seldom found even on flowering specimens.

14. *Bonnetia duidae* Kobuski & Steyermark, sp. nov.

Frutex 1–2 m. altus; ramulis crassis, juventute hirsutis, apice dense cicatricosis. Folia coriacea, ad apicem ramulorum conferta, lanceolata, sessilia, juventute supra hirsuta, 4.5–5.5 cm. longa, 1–1.4 cm. lata, apice acuta, basi rotundata, margine integra, costa basi expansa, supra plana basi hirsuta, subtus elevata, glabra, venis lateralibus numerosis, proximis (ca. 20 per cm.), parallelibus, sub angula acutissimo adscendentibus, supra ut videtur aciculatis, subtus prominulis. Flores apice ramulorum solitarii; pedicellis hirsutis, 1.3 cm. longis; sepalis 5, imbricatis, lanceolatis, ca. 3 cm. longis, 1 cm. latis, duobus exterioribus omnino dorsali hirsutis, tribus interioribus in parte medio dorsali hirsutis margine latiori scariosis; petalis 5, roseis, obovatis, papyraceis, 4–5 cm. longis, 1.5 cm. latis; staminibus numerosis; filamentis 8–10 mm. longis, liberis basi exceptis; antheris 1.5 mm. longis; ovario ovoideo, glabro, 3-loculari, multi-ovulato, stylo 1.4 cm. longo, apice 3-partito. Fructus non visus.

VENEZUELA: Territorio Federal Amazonas: Summit of Cerro Duida, Brocchinia Hills, dry ridge top, alt. 1700–1800 m., *J. A. Steyermark 58186* (TYPE, Ch), Sept. 1, 1944 (shrub 4–5 ft. tall; leaves in terminal rosette, coriaceous, deep rich olive green above, yellow or golden green beneath, petals deep rose).

The cortex of the terminal branchlets of this species is roughened by the elliptic leaf-scars which appear in such close proximity as to simulate the rough branches of some of the species of *Abies*. At the tips of the very young branchlets, between the densely occurring leaf-scars, can be found a hirsute pubescence which vanishes shortly after the leaves fall.

Only a very few leaves are to be found on the specimen. Steyermark in his field notes mentions the leaves as being "in a terminal rosette" — and so they appear. The lanceolate shape is unusual for the genus. The extremely close parallel veins ascend at a very acute angle and they are of such great number and are so close that one is reminded of the veining in *Calophyllum*. The midrib fans out noticeably at the base causing the leaf-scar to become wider than long. The upper surface of the very young or unfolding leaves is completely covered with a hirsute pubescence. The under surface is glabrous. As the leaf matures the pubescence disappears except for a tuft of hair at the base of the midrib on the upper

surface. Leaves can be found with hirsute midribs and ciliate margins in varying degrees of pubescence.

The pedicels and calyx-lobes are also hirsute. This pubescence on the long-lanceolate calyx-lobes constitutes a very important means of distinction. The two outer lobes are pubescent over the entire exterior surface. On the inner lobes, the pubescence is confined mostly to the portion exposed in the imbricate arrangement, the innermost lobe being completely glabrous. The margins of the lobes are scarious. As the intensity of the pubescence decreases, the width of the scarious margin of the inner lobes increases.

In most species, the width of the petals at the apex is about equal to their length. In this species, the width of the petal is only half that of the length.

The closest relative is *B. lanceifolia* Kobuski which differs from the present species in (1) the absence of pubescence on the leaves and branchlets, (2) the shorter and glabrous peduncles and sepals, (3) the shorter petals (2 cm.) as wide as long, and (4) the very few (5-7) pairs of veins inconspicuous on both surfaces of the leaves.

15. *Bonnetia lanceifolia* Kobuski, sp. nov.

Habitus ignotus (probabiliter frutex). Ramuli teretes, glabri, griseo-brunnei, foliis paucis apice confertis. Folia coriacea, glabra, lineari-lanceolata vel lanceolata, 4.5-6.5 cm. longa et 0.7-1.3 cm. lata, apice acutissima basi cuneata, sessilia, margine integra, venis 5-7 paribus, arcuato-ascendentibus, undique inconspicuis. Flores apice ramulorum solitarii, axillares; pedunculis glabris, teretibus, 4 mm. longis; sepalis 5, imbricatis, glabris, inaequalibus, duobus exterioribus ovato-lanceolatis, 10-11 mm. longis, ca. 6 mm. latis, apice acutis vel subacutis, tribus interioribus late ovatis, 12-14 cm. longis et 8 mm. latis, apice obtusis vel subrotundatis, margine scariosis; petalis 5, convolutis, flabelliformibus, 2 cm. longis, apice 1.5-2 cm. latis; staminibus numerosis; filamentis filiformibus glabris, ca. 6 mm. longis, liberis basi exceptis; antheris oblongis, ca. 1.5 mm. longis; ovario glabro, conico, ca. 4 mm. longo, 3-loculari, multi-ovulato, apice in stylum attenuato; stylo glabro, 5 mm. longo, apice ad 1.5 mm. 3-partito, stigmatibus 3. Fructus non visus.

VENEZUELA: Bolivar: Cerro Guaiquinima, Alto Río Paragua, alt. 1740 m., *F. Cardona* 942 (TYPE, US), Oct. 1943.—Same locality, alt. 1600-1800 m., *F. Cardona* 1126 (US), July 15, 1944.

This species in leaf-shape and leaf-size resembles *B. duidae* Kobuski & Steyermark. However, in *B. duidae* the upper surface is hirsute and the many veins, distinguishable on both surfaces, are so close together that counting becomes difficult.

Further differences between the two species can be found in the flower. In the present species, the peduncles are glabrous and measure but 4 mm. long, the sepals are glabrous, and not longer than 1.4 cm., the corolla (2 cm. long) is as broad at the apex as long, the anthers 1.5 mm. long, and the style 3-parted for only 1.5 mm. at the apex. In *B. duidae*, the peduncles are hirsute, measuring 13 mm. long, the sepals also are hirsute,

lanceolate, and 3 cm. long, the corolla (3 cm. long) is only one-third as wide as long, the anthers 6 mm. long, and the 3 styles separate to the base.

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## ADDITIONAL NOTES ON THE CONVULVULACEAE OF NEW GUINEA

S. J. VAN OOSTSTROOM

*With one plate and one text-figure*

IN A PAPER prepared for *Nova Guinea*, n. s. 5: 15–34,<sup>1</sup> the author gave an enumeration, with keys to the genera and species, of the Convolvulaceae known from New Guinea and adjacent islands. When that paper was already in press, a collection of Convolvulaceae made by Mrs. Mary Strong Clemens in the Morobe District, Northeast New Guinea, reached him, through the Arnold Arboretum. Moreover, a few specimens from other collections, mainly those of Mr. L. J. Brass, gathered during the Archbold Expeditions, were put at his disposal. A list of them with some notes and the description of a new species of *Erycibe* follow here.

The specimens are in the herbarium of the Arnold Arboretum (A); some duplicates are in the Rijksherbarium at Leiden (L).

### Evolvulus L.

*Evolvulus alsinoides* L. var. *decumbens* (R. Br.) Van Ooststr. in Meded. Bot. Mus. in Herb. Utrecht 14: 38. 1934; id. in *Nova Guinea*, n. s. 5: 17.

NORTHEAST NEW GUINEA: Morobe District, Wantoat (Wantot), alt. 3500–6000 ft., flowers blue, *M. S. Clemens* 11028, Jan. 23, 1940 (A); id., Boana, alt. 2500–4500 ft., flowers pale blue, *M. S. Clemens* 41628, May–Nov., 1940 (A).

DISTRIBUTION: Australia, New Guinea, New Caledonia, Fiji Islands, Netherlands Indies, Philippines, Indo-China, China.

This is the only variety of the variable *E. alsinoides* L. occurring in New Guinea.

### Erycibe Roxb.

*Erycibe Hellwigii* Prain in Jour. Asiat. Soc. Beng. 63: 84. 1894, note; Van Ooststr. in *Nova Guinea*, n. s. 5: 18.

NORTHEAST NEW GUINEA: Morobe District, Malalo Mission (Salamaua), margin of hill woods, alt. 800–900 ft., on small trees; fruit of brick colour, *J. & M. S. Clemens* 3183, May 25, 1936 (A); id., vicinity of Kajabit Mission, alt. 800–2000 ft., *M. S. Clemens* 10791, Aug.–Dec. 1939, a fruiting specimen (A); id., vicinity of Kajabit Mission, gully woods, steep above rivulet, alt. 1300 ft., tall vine; fruit bronze yellowish, *M. S. Clemens* 40858, Dec. 29, 1939 (A).

DISTRIBUTION: Endemic in New Guinea.

*Erycibe Clemensae* sp. nov. PLATE I; fig. 1, a, b.

Frutex (scandens?), ramulis junioribus subteretibus, mox rimis longitudinalibus nonnullis subangulatis, c. 2–3 mm. crassis, dense ferrugineo-tomentosis pilis stellatis 3–4(–6)-brachiatis, ramulis adultioribus glab-

<sup>1</sup> Not yet published.



rescentibus. Folia petiolata, petiolis (5-)7-8 mm. longis, tomentosis ut ramuli; laminis satis parvis coriaceis, ellipticis vel oblongo-ellipticis interdum obovatis interdum oblongis, apice obtusis et breviter acuminatis, basi acutis vel subobtusis, margine integerrimis, supra nitidis, subtus opacis, 5-7.5 cm. longis, (1.5-)2-3.5 cm. latis, glaberrimis nervo mediano utrinque excepto; nervo mediano nervis lateralibus utrinque 5 vel 6 supra impressis subtus prominentibus, nervis minoribus supra haud vel vix conspicuis, subtus indistinctis. Inflorescentiae tomentosae ut ramuli, axillares vel terminales, racemosae vel angustissime paniculatae, foliis breviores vel paullo longiores, (2.5-)4-10 cm. longae; flores breviter pedicellati, pedicellis 2-3 mm. longis tomentosis; bracteis lineato-oblongis, 1.5-4.5 mm. longis, concavis, externe tomentosis, interne glabris. Sepala concava

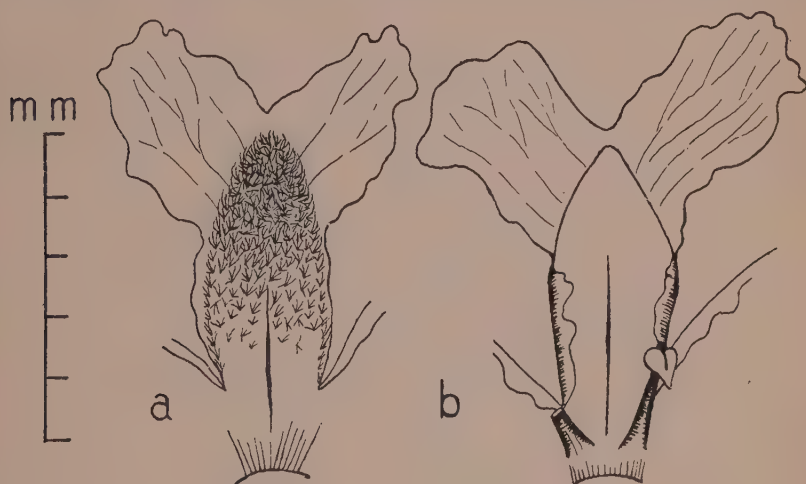


FIG. 1. *Erycibe Clemensae* sp. nov.: corolla-lobes, *a* from without, *b* from within.

orbicularia vel transverso-elliptica, apice late rotundata, 2.5-3 mm. longa, externe tomentosa interne glabra, interiora marginibus lateralibus tenuioribus. Corolla 5-partita, c. 7.5 mm. longa, basi glabra, fasciis 5 mesopetalis carnosius oblongis externe dense tomentosis; lobulis oblongis vel rectangularibus apice truncatis vel irregulariter grosse crenatis, supra fasciam mesopetalam breviter connatis, basi in fasciam mesopetalam decurrentibus, 3-3.5 mm. longis. Stamina prope basin corollae inserta; longitudo filamenti sesquiplez antherae; antherae incurvatae, cordiformes, acutae. Ovarium oblongum vel obovoideum, parte inferiore glabra, parte superiore tomentosa, stigmate apice radiatim 5-carinato.

NORTHEAST NEW GUINEA: Morobe District, Wareo, alt. 2000 ft., *Clemens* 1622, Jan. 13, 1936, TYPE in herb. Leiden, sub no. 937,351-618; another specimen in the herbarium of the Arnold Arboretum; id. Wareo, alt. 2000 ft., in hill forest, prob. a shrub, not high; flowers cream-yellowish, *J. & M. S. Clemens* 1502, Jan. 4, 1936 (L.).

The Latin description has been based on the type; in *Clemens* 1502 the leaves are ovate to oblong-lanceolate and larger than those of the type, up to 10 cm. long and 4.5 cm. wide.

Named in honour of the keen and indefatigable collector Mary Strong Clemens.

*Erycibe nitidula* Pilger in Bot. Jahrb. 59: 85. 1924; Van Ooststr. in Nova Guinea, n. s. 5: 18.

NETHERLANDS NEW GUINEA: Idenburg River, 6 km. SW. of Bernhard Camp, alt. 1200 m.; rain-forest canopy liana; fruits immature, *L. J. Brass 12803*, Feb. 1939 (A, L). NORTHEAST NEW GUINEA: Morobe District, Wantoat (Wantot), alt. 3500–6000 ft., *M. S. Clemens 11056*, Jan. 27, 1940 (A). PAPUA: Central Division, Dieni, Ononge Road, alt. 700 m., common in rain-forest; a very large liane, leaves dull, smooth, fruit orange-red, c. 1.5 cm. long and 1.3 cm. thick at base, slightly tapering to blunt apex, *L. J. Brass 3918*, May 12, 1933 (A).

DISTRIBUTION: Endemic in New Guinea.

The leaves of *Brass 3918* are much smaller than those of the type specimen as well as of *Brass 12803* and of *Clemens 11056*; the largest ones are 8 cm. long and nearly 3.5 cm. wide. In the type specimen, *Schlechter 16941*, the lower surface of the leaves is glabrous; in *Clemens 11056* it is rusty-tomentose, whereas in *Brass 12803* it is almost glabrous with exception of the densely hairy midrib.

*Erycibe floribunda* Pilger in Bot. Jahrb. 59: 84. 1924; Van Ooststr. in Nova Guinea, n. s. 5: 19.

NETHERLANDS NEW GUINEA: Slieber, 40 km. inward of Nabire, in fringing forest, alt. 300 m.; scandent; flowers white; fruit red, *R. Kanehira & S. Hatusima 12674*, March 9, 1940 (A).

DISTRIBUTION: Only known from Netherlands New Guinea and found north as well as south from the Central Range.

The leaves of this specimen are slightly broader than those of the other collections of the species.

In order to insert *Erycibe Clemensae* into the key to the New Guinean species of *Erycibe*, in Nova Guinea, n. s. 5: 18, this has to be altered as follows:

- 1a. Sepals nearly 5 mm. long; flowers in short and dense axillary and terminal racemes, at most up to 3.5 cm. long.....*E. grandiflora* Adelb.
- 1b. Sepals not exceeding 3 mm.; inflorescences mostly longer, less dense, racemose or paniculate. ....2
- 2a. Reticulate venation between the lateral nerves distinct on both sides.....3
- 2b. Reticulate venation between the lateral nerves indistinct, at least above.....4
- 3a. Inflorescence a wide, many-flowered panicle; flowers small; sepals 1.5–2 mm. long; corolla c. 6–7 mm. diam.....*E. floribunda* Pilger.
- 3b. Inflorescence a narrow panicle or raceme, fewer-flowered; flowers larger; sepals 2.5 mm. long; corolla c. 8–9 mm. diam.....*E. nitidula* Pilger.
- 4a. Anthers acute to very shortly apiculate at the top; bracts minute.....5
- 4b. Anthers with a linear appendage at the top; bracts partly leaf-like and up to 10–12 mm. long. ....*E. Schlechteri* Pilger.
- 5a. Corolla c. 7.5 mm. long; lateral nerves slightly impressed above; anthers acute. ....*E. Clemensae* Van Ooststr.
- 5b. Corolla smaller; lateral nerves as far as visible slightly prominent above; anthers acute to shortly apiculate. ....*E. Hellwigii* Prain.

Of *E. induta* Pilger the flowers are unknown. It is characterized in that the rusty brown tomentum on the branches and the lower leaf-surface persists for a long time.

*Jacquemontia* Choisy

*Jacquemontia paniculata* (Burm. f.) Hallier f. in Bot. Jahrb. 16: 541. 1893; Van Ooststr. in Blumea 3: 269. 1939; id. in Nova Guinea, n. s. 5: 20.

PAPUA: Central Division, Nakeo District, Baroka, savannah forests, alt. 50 m., common; twining on shrubs and tall grasses; leaves pale green; flowers pale pink, *L. J. Brass* 3709, April 1933 (A).

DISTRIBUTION: Tropical East Africa, Madagascar and adjacent islands, India (Central Provinces and Bombay to S. India; Ceylon; Assam), Indo-China, Malaysia, New Guinea (known from the eastern part of the island, not yet from Netherlands New Guinea), Bismarck Archipelago, New Caledonia, tropical Australia.

*Merremia* Dennst. em. Hallier f.

*Merremia gemella* (Burm. f.) Hallier f. in Bot. Jahrb. 16: 552. 1893; Van Ooststr. in Blumea 3: 297. 1939; id. in Nova Guinea, n. s. 5: 22.

NETHERLANDS NEW GUINEA: Idenburg River, Bernhard Camp, alt. 50 m., climbing on low seral vegetation of deeply flooded river plains; rare; sap milky; flowers yellow, *L. J. Brass* 13993, April 1939 (A, L).

DISTRIBUTION: S. E. Asia, Malay Archipelago, Philippine Islands, New Guinea, tropical Australia.

This is the typical form of the species; var. *splendens*, also known from New Guinea, has the corolla much larger, up to 3.5 cm. long.

*Merremia quinata* (R. Br.) Van Ooststr. in Nova Guinea, n. s. 5: 24.

NORTHEAST NEW GUINEA: Morobe District, vicinity of Kajabit Mission, open thicket, alt. 700-900 ft., vine, flowers white, *M. S. Clemens* 10638, Aug. 31, 1939 (A).

DISTRIBUTION: North Australia, Queensland, New Guinea. Mentioned from the Philippine Islands, Burma, and S. China, but it is not quite certain that the specimens from there belong to the species.

*Operculina* S. Manso

*Operculina Turpethum* (L.) S. Manso, Enum. Subst. Bras. 16. 1836; Van Ooststr. in Blumea 3: 362. 1939; id. in Nova Guinea, n. s. 5: 25.

NORTHEAST NEW GUINEA: Morobe District, Kajabit Mission, thicket trail, alt. 900 ft., flowers white, *M. S. Clemens* 10830 bis, Nov. 23, 1939 (A).

DISTRIBUTION: Tropics of the Old World; introduced in tropical America.

*Ipomoea* L.

*Ipomoea polymorpha* R. & S. Syst. 4: 254. 1819; Van Ooststr. in Blumea 3: 493. 1940; id. in Nova Guinea, n. s. 5: 28.

NORTHEAST NEW GUINEA: Morobe District, vicinity of Kajabit Mission, alt. 800-2000 ft., flowers lavender-purple, *M. S. Clemens* 10694, Aug.-Dec. 1939 (A).

DISTRIBUTION: Africa (Abyssinia), British India (?), Formosa, Malay Archipelago (E. Java, Lesser Sunda Islands), Philippine Islands, N. E. Australia.

This is, as far as I am aware, the first record from the main island of New Guinea, the species being already known from Thursday Island.

*Ipomoea congesta* R. Br. Prodr. Fl. Nov. Holl. 485. 1810; Van Ooststr. in Blumea 3: 500. 1940; id. in Nova Guinea, n. s. 5: 28.

NORTHEAST NEW GUINEA: Morobe District, Matap, alt. 4000 ft., flowers blue; on treelet in garden, *M. S. Clemens* 41112, April 2, 1940 (A).

DISTRIBUTION: Pantropical.

*Ipomoea gracilis* R. Br. Prodr. Fl. Nov. Holl. 484. 1810; Van Ooststr. in Blumea 3: 516. 1940; id. in Nova Guinea, n. s. 5: 30.

NETHERLANDS NEW GUINEA: Idenburg River, Bernhard Camp, scrambling over low stands of *Ficus* and *Hibiscus tiliaceus* fringing creeks of river flood plain at 50 m.; flowers pink, *L. J. Brass* 13940, April 1939 (A, L).

DISTRIBUTION: Coasts of the Indian and Pacific Oceans, also more inland: Madagascar and adjacent islands, British India, Ceylon, Indo-China, Malay Peninsula, Malay Archipelago, Philippine Islands, New Guinea, North Australia, Pacific Islands; according to Hallier in Mexico and the West Indies.

*Ipomoea aquatica* Forsk. Fl. Aeg.-Arab. 44. 1775; Van Ooststr. in Blumea 3: 528. 1940; id. in Nova Guinea, n. s. 5: 30.

NORTHEAST NEW GUINEA: Morobe District, vicinity of Kajabit Mission, alt. 800-2000 ft., *M. S. Clemens* 10604, Aug.-Dec. 1939 (A).

DISTRIBUTION: Pantropical.

*Ipomoea alba* L. Sp. Pl. 161. 1753; Van Ooststr. in Blumea 3: 547. 1940; id. in Nova Guinea, n. s. 5: 31.

NORTHEAST NEW GUINEA: Morobe District, Wantoat, alt. 3900 ft., flowers white; *M. S. Clemens* 41175, April 11, 1940 (A).

DISTRIBUTION: Pantropical.

*Ipomoea asterophora* Van Ooststr. var. *subglabra* Van Ooststr. in Blumea 3: 563. 1940; id. in Nova Guinea, n. s. 5: 33.

NETHERLANDS NEW GUINEA: Idenburg River, Bernhard Camp, climbing on fringe vegetation of deeply flooded rain-forest, alt. 50 m.; flowers pink, *L. J. Brass* 13990, April 1939 (A, L).

DISTRIBUTION: Endemic in New Guinea.

#### Lepistemon Bl.

*Lepistemon urceolatum* (R. Br.) F.v.Muell. Syst. Census Austr. Pl. 94. 1882; Van Ooststr. in Blumea 5: 344. 1943; id. in Nova Guinea, n. s. 5: 33.

NORTHEAST NEW GUINEA: Morobe District, Boana, alt. 3000 ft., common vine, *M. S. Clemens* s. n., May 23, 1940 (A); id., Wantoat, open woods; flowers white, *M. S. Clemens* 41097, March 30, 1940 (A). PAPUA: Central Division, Mafulu, alt. 1250 m.; twining on forest regrowth bushes, *L. J. Brass* 5535, Sept.-Nov., 1933 (A).

DISTRIBUTION: Eastern part of the Malay Archipelago (Celebes, Moluccas), New Guinea, tropical Australia, Bougainville Island.

RIJKSHERBARIUM,

LEIDEN, THE NETHERLANDS.

#### EXPLANATION OF THE PLATE

*Erycibe Clemensae* sp. nov. Type in the Rijksherbarium, Leiden, the Netherlands.





ERYCIBE CLEMENSÆ VAN OOSTSTROOM



## DESCRIPTIONS OF NEW CHINESE PLANTS

FAITH CHUN

TYPES of the new species described below are deposited in the herbarium of the Botanical Institute of San Yatsen University; duplicates have been set aside for the herbaria of the Arnold Arboretum and the Institute of Economic Botany of the National University of Kwangsi.

*Capparis urophylla* sp. nov.

Frutex vel arbuscula usque ad 4 m. altus (fide Liang) inermis floribus exceptis glaberrimus ob aspectum delicatum satis jucundus ramulis teretibus albido-viridibus hornotinis filiformibus modice elongatis annotinis gracilibus anno tertio 4–5 mm. crassis. Stipulae caducae ignotae. Folia decidua disticha tenue herbacea tempus fructu chartacea supra laete viridia subtus pallidiora sicco flavescentia subconcoloria ambitu satis variabilia elliptica elliptico-lanceolata infima interdum elliptico- vel ovato-trapezoidia basi cuneata circa medium in caudam longam contracta; caudae laminis paululo longiores vel subaequantes graciles medio 1.5–2 mm. latae rectiusculae curvatae vel interdum falcatae apice obtusae vel truncatae; laminae (cauda inclusa) 3.5–7.5 cm. longae 1.2–2.2 cm. latae margine paulo incrassata sicco crebre obscureque crenulatae costa et nervis utrinsecus circ. 5 obliquis procul ante marginem arcuato-anastomosantibus venulosus tenuibus siccitate utrinque eminentibus trabeculis crebris sub lente tantum prominulis; petioli filiformes 4–5 mm. longi supra canaliculati. Flores mediocres axillares solitarii nutantes albi pedicellati; pedicelli graciles 8 mm. longi teretes; sepala 4 imbricata chartacea concava minute glanduloso-maculata utrinque plus minusve floccoso-tomentella inaequalia, exteriora 2 majora 4.5–5 mm. longa 3–3.5 mm. lata uno late obovato apice leviter incurvo altero subrotundato valde cucullato, interiora angustiora 4 mm. longa 2 mm. lata elliptico-oblonga; petala 4 tenuia utrinque floccoso-villosula margine ciliata subaequalia 5.5 mm. longa, latiora elliptico-oblonga 2.5 mm. lata, reliqua spathulato-oblonga 2 mm. lata; stamina circ. 18, filamentis filiformibus 10–12 mm. longis ante anthesin sinuoso-pluriplicatis; antherae dorso affixae oscillatorii brunnescentibus anguste ovoideis 1.2 mm. longis basi breviter discretis apice minute umbonatis; torus crassus glaber obscure 4-lobatus. Gynophorum 6–14 mm. longum glabrum. Ovarium purpurascens glabrum ovoideum sursum leviter contractum, placentis 2 ovulis paucis. Bacca globosa 6–8 mm. diam. flava dense papillosa, pedicello 12 mm. longo suffulta.

KWANGSI: Hsing-On Hsien, Hwa-Kiang Hsiang, Lao-Fu Shan, shrub at the foot of the hill, leaves green above, pale green beneath, flowers white, June 7, 1936, *Z. S. Chung* 81701 (TYPE); same district, Hwa-Kiang, side of stream, shrub in young fruit, Nov. 3, 1937, *Z. S. Chung* 83676; Pai-Sou Hsien, Liang-Chiang enroute to Bai-Sou city, base of San-Ta-Ling, shrub 1.3 m. tall, fruits yellow, Aug. 17–18, 1937, *Y. W. Taam* 6. KWANGTUNG: Shi-Wan-Ta Shan, Ta-Chi-Hsu, in dense woods of ravine, in young fruit, shrub 4 m. tall, Aug. 10, 1937, *H. Y. Liang* 70019.

This is a very distinct species of a beautiful delicate habit, with usually

long-tailed leaves, solitary small white 4-merous flowers, comparatively few stamens on long flexuously folded filaments, and a 1-celled ovary with apparently few-ovuled placentas.

*Acer bicolor* sp. nov.

**Arbusculus.** Ramuli robusti obtuse angulati sine lenticellis hornotini purpurascens annotini nigrescentes vetustiores griseo-brunnei tenuiter striati lenticellis perpaucis instructi. Gemmae atro-virides ovoideae obtusae 3 mm. longae, perulis paucis exterioribus subrotundatis interioribus ovatis glabris margine breviter ciliato excepto. Folia coriacea glaberrima quinqueloba lamina latiora quam longa 12–20 cm. lata 8–14 cm. longa, supra olivacea nitida subtus intense purpurascens, basi cordata sinibus apertis profundis interdum subtruncata sinibus fere occultis; lobi dimidiam laminam attingentes, duobus inferioribus fere horizontaliter divaricatis quam ceteris vix minoribus, lanceolato-ovati subito longo-acuminati apicibus mucronulatis margine integris vel obscure crenulatis raro versus apicem loborum inciso-paucidenticulatis; nervi primarii validi elevati supra initio purpureo-colorati nervis secundariis nervisque densis elevatis conspicue reticulatis conjuncti. Inflorescentia andro-monoclina terminalia paniculata multiflora pedunculo glabro tereti 2.5–4 cm. longo insidens; pedicelli circ. 5 mm. longi glabri; sepala 5 viridia concava oblonga vel ovato-oblonga, 4 mm. longa, obtusa extus glabra intus sericeo-floccoso-villosa margine ciliata; petala 5 sepalis breviora glabra suborbicularia 3 mm. longa margine undulata; stamina 8, antheris elliptico-oblongis, 1.5 mm. longis, filamentis glabris, 4 mm. longis; discus crassus extra-stamineus; ovarium dense pilosum, stylo curvato glabro vix distincte bilobulato, 2 mm. longo supra medium canaliculato et papilloso apice decurvato coronans. Fructus non visus.

KWANGSI: Yao Shan, Lo-Hsiang, in flower, May 9, 1929, *S. S. Sin* 8958, Bot. Inst. Herb. No. 124596; Ku-Chen, June 27, 1934, *S. S. Sin* 23311, Bot. Inst. Herb. No. 124595; Hsiang Hsien, Shang Ku-Chun, Five Finger Mountain, small shrub 4 m. tall on peak, leaves green above, purple-red beneath; petals white, June 19, 1936, *C. Wang* 39468 (*Bot. No. B/581*) (TYPE).

This species belongs to the Sect. *Spicata* but is no more closely related to any one species than to another of that Section. It has the villose sepals of *Acer erianthum* Schwerin with the inflorescence of *A. sinense* Pax. From both of these, our new species differs in large, subequally 5-lobed, strictly glabrous leaves with the two basal lobes as large as the upper ones and horizontally spreading. In all the flowers examined from specimens preserved in formalin the style is not distinctly bilobed as in most species of the genus but has the stigmatic portion separated only by a longitudinal groove and in time becomes strongly revolute.

This is a most attractive maple, with beautiful strongly-veined two-colored leaves, the brilliant purplish red color of the lower surface contrasting vividly with the bright olive-green of the upper surface. Efforts are being made to collect seeds of this lovely plant for introduction as a garden ornament.

*Mahonia subimbricata* W. Y. Chun & F. Chun, sp. nov.

Arbuscula ut videtur humilis caulis (partibus inferioribus ignotis) hornotinis luteo-viridibus nitidis striatis 8 mm. crassis basi perulis arcte



imbricatis purpurascensibus scariosis striatis apice obtusis erosulis involutis. Folia multa conferta, 12–22 cm. longa, rhachi subterete tenui unilateraliter sulcata basi stipulis binis subulatis rectis 4–5 mm. longis suffulta, internodiis brevibus antrorsum decrescentibus posteriore vix ultra 20 mm. longo anteriore 5–10 mm. longo, foliorum paribus 11–13 porrecto-patentibus jugo infimo multo minore 6–8 mm. supra petioli basin inserto, secundo ab aliis remotiore, jugis superioribus contiguis antrorsum manifeste imbricatis. Foliolum terminale maximum 2.5–4 cm. longum oblongo-ovatum symmetricum basi rotundatum vel cordatum, margine 5–7-dentatum, foliola lateralia parva inaequalia a medio folii utrinque sensim decrescentia, media 2.5–3.5 cm. longa circ. 1.5 cm. lata, superiora inferioraque 1.5–2 cm. (raro usque ad 2.5 cm.) longa, ovata vel elongato-ovata subito longeque acuminata basi truncata margine anteriore 3–5-dentata posteriore 6–8-dentata dentibus erectis irregularibus tenuibus spinuloso-apiculatis spinulis leviter incurvatis, rigide coriacea supra olivacea subtus glaucescentia (e nota ad vivum), sicco supra opaca nervis primariis 3 impressis tenuibus evenulosis supra medium evanescentibus subtus flavida subnitida nervis primariis leviter tantum elevatis venulis indistinctis. Racemi circ. 13 aggregati 7–9 cm. longi simplices pluriflori floribus inter se 4 mm. distantibus basi bracteis scarioso-membranaceis elliptico-loratis circ. 12 mm. longis 5 mm. latis purpurascensibus striatis apice oblique truncatis fibrilloso-erosulis instructi. Flores (pauci tantum satis expansi) flavi; bracteolae anguste ovato-oblongae acutae concavae incurvatae pedicellis ad 3 mm. longis tenuibus fere duplo longiores; sepala concava 3 externa minima late ovata, 2 mm. longa 1.5 mm. lata 5-nervia, cetera obovato-oblonga 3 mm. longa, 3 media 2 mm. lata 5-nervia, 3 interna leviter angustiora 3-nervia; petala sepalis internis conformibus paullo vel vix minora 1-nervia nervo supra medium biramoso, apice obtusa integra basi attenuata biglandulifera glandulis lineari-ellipticis divaricatis. Stamina petalis paulo breviora, filamentis linearibus levibus, antheris aequilongis angustioribus, connectivis obtusis. Ovarium anguste ellipsoideum 2 mm. longum estylosum uniovulatum (an semper?), stigmatibus magno discoideo. Bacca ignota.

KWANGSI: Ching-Hsi Hsien, An-Teh District, Tung-Kong Village, shrub on forested slope, leaves olive green above, glaucous green beneath, flowers yellow, Sept. 21, 1935, S. P. Ko 55791 (TYPE).

We have not been able to associate this neat and very attractive plant with any of the Asiatic species of the genus, on account of its distinctive foliage. The rhachis of the leaves has relatively short internodes, which decrease in length upwards so as to make the upper leaflets overlap each successive pair. Furthermore the leaflets are not uniform in size, those near the middle of each leaf being largest, with a noticeable gradual diminution in length towards both extremities. The leaves are reminiscent of those of *M. conferta* Takeda, but that species has larger, differently shaped leaflets with fewer coarser dentations, larger more numerous crowded flowers with bifid petals, and a distinct style.

## THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1948

**Horticulture.**— During the past year special efforts have been made to improve the grounds and rearrange the plantings so that they can be maintained with a minimum of hand labor. Labor costs have doubled since 1942. Less labor was used on the grounds than during the previous year, but mechanized equipment has made the labor more effective.

Ten tons of fertilizer and several tons of lime were applied to various collections, particularly the elms, lilacs, rhododendrons, maples and viburnums. The response of the trees and shrubs justifies the fertilizer application.

The "Blitzer" mower, drawn by a tractor, has proved to be a major factor in keeping the grounds neat, and in reducing fire hazards. The improvement is especially striking in the Conifer Collection.

The mulching of the trees and shrubs with spent hops from a local brewery has been very effective in promoting growth and reducing weeds. Last winter we obtained 2824 cubic yards of peat moss at a cost of \$882. Much of it was distributed along Meadow Road where we are to plant an azalea collection, some was used in the Shrub Collection and a considerable stock pile has been accumulated. Peat moss is now used in practically all new plantings.

Many of the plants in the Shrub Collection have been rearranged, and eventually we plan to move the vines to the wall along the Arborway. The shrubby *Cornus* were moved to the Bussey Hill area. The best of the deutzias, spiraeas and weigelas have been moved to the Shrub Collection and the rest moved to Weston.

Mr. John S. Ames contributed \$3000 to be used specifically for the renovation of Peter's Hill, an area long neglected due to lack of labor. Work was started in June and we expect to complete the removal of dead and surplus trees by fall so that the area can be seeded to grass and new plantings started as soon as possible.

A collection of 36 color prints was made and displayed at the Spring Flower Show. Both color and black and white photographs have been made for projection and publication. Our horticulturist has given 15 lectures during the year, largely to garden club groups. The usual number of ARNOLDIA, our journal of popular information, have been issued.

The assistant horticulturist spends most of his time checking the names of plants removed from or added to the collections so that our records are always up to date. During the year, 4173 display labels and 1246 record labels were made.

We received 1087 cuttings or scions, 974 packages of seed and 861 plants during the year. Our propagator grew 60 flats of seedlings, rooted 652 cuttings and made 2,290 grafts. He distributed 317 cuttings, 695

packages of seeds and 459 plants. In addition, a total of 532 packets of *Metasequoia* seeds, which were sent to Dr. Merrill from China, have been distributed over a wide area.

The Case Estates in Weston have proved to be of great value in the Arboretum work. The nurseries now include 1600 kinds of plants. Many of the less ornamental shrubs are in a permanent planting and consist of 418 species and varieties. The hybrid seedlings developed at the Arnold Arboretum are tested at Weston. Approximately seven acres of land are used for tree breeding test plots and half an acre of hybrid corn was grown for the Bussey Institution. The Department of Landscape Architecture is slowly developing its project and the Weston Garden Club assists with the perennial garden and in return obtains cut flowers for its work in local hospitals. Several horticultural experiments are being conducted on this land.

A new hybrid cherry has been distributed to cooperating nurserymen. This hybrid is a semi-double flowered dwarf plant which retains its flowers for a long period. It has been named "Hally Jolivette," the maiden name of the wife of the plant breeder. Several apple hybrids have been distributed for testing, but have not yet been named. Some of the new *Forsythia* hybrids show much promise. Root stock studies are being continued to discover dwarfing stocks for both ornamental and commercial trees and shrubs. Cytological studies have been largely confined to work with x-rays.

**Comparative Morphology.** — Professor Bailey and his co-workers have continued their investigation of the comparative morphology of various dicotyledonous families with special emphasis upon the structure of carpels and stamens, nodal anatomy and pollen morphology. A wealth of carefully preserved material, collected by Dr. A. C. Smith in Fiji, has enabled Dr. B. G. L. Swamy to complete a very thorough and significant study of the Degeneriaceae. Mr. J. E. Canwright is completing a comprehensive study of the Magnoliaceae, Mr. R. W. Vanderwyk of the Annonaceae and Mrs. Lillian N. Money of the Monimiaceae. Mr. Armando T. Hunziker, a Research Fellow from Argentina, is initiating an investigation of the Lardizabalaceae. Two observations of particular significance have been: (1) that the New Caledonian endemic, *Amborella tricapoda* Baill., is a new morphological type of vesselless dicotyledon, and (2) that the wood of the much discussed *Metasequoia* contains traumatic resin canals indicative of relationship to *Sequoia* rather than to *Taxodium* or other genera of the Taxodiaceae.

**The Herbarium.** — During the year 9395 specimens were mounted, of which 8480 were added to the herbarium, which now contains 634,487 specimens.

Accessions during the past fiscal year numbered 59,955 specimens, of which only 12,112 came through exchange, the greater part coming from subsidized exploration and work of our staff. Some of the more important

exchanges consist of 4803 specimens from the Natural History Museum, Paris (material from southeastern Asia, New Caledonia, and western Africa), 1657 from the Botanic Garden, Singapore (material from Malay), and over 1200 specimens from the Rijksherbarium, Leiden (material from Siam). Our largest accession is the work of a staff member, the 26,000 specimens assembled by Dr. A. C. Smith during his nine months of field work in Fiji. As results of subsidies given to Chinese botanists in previous years, over 15,000 Chinese specimens were received from the National Szechuan University, over 2400 from the Yunnan Botanical Institute, and a smaller number from National Central University, Nanking. Of special interest among these latter collections is material of recently discovered living plants previously known only as fossils. As a result of our close co-operation with Chinese botanists the Arboretum was able to acquire seeds of the *Metasequoia* and make the first general distribution of them to botanic gardens and horticulturists in America and Europe.

A total of 14,658 specimens was sent out from the herbarium, most of which (907 unmounted and 10,972 mounted) represent continuation of inter-institutional transfer of American tropical material to the Gray Herbarium in Cambridge.

The Arboretum has received 39 requests for the loan of herbarium material. These came from 12 American and 9 foreign institutions and involved 3902 of our specimens. For the study of our own staff, 2274 specimens were borrowed from 6 American and 6 foreign institutions.

Professor Rehder has continued work on the bibliography and synonymy of American cultivated trees and shrubs. The large volume, now mostly printed, will probably appear next year. Dr. Merrill has finished his detailed study of the botanical works of Rafinesque and sent his bulky manuscript to the printer. He sailed for Europe May 15 to attend the symposium on botanical nomenclature held at Utrecht, Holland, being one of three delegates representing the United States. Having three weeks in England and three in Holland, he was able to accomplish considerable botanical work in the major herbaria at London, Kew, and Leiden. Dr. Johnston finished a report on some of his botanical work done in Panama during the recent war and has resumed work on the West Indian and Central American Boraginaceae, preparatory to writing an account of the family for the Flora of Trinidad. Dr. Smith, absent during a year of field work in Fiji, returned to the Arboretum in March and began organizing his extensive collections for study. Dr. Kobuski furthered his studies of the Theaceae. In addition to his other duties he assumed rather heavy editorial duties during Dr. Smith's absence. Dr. Caroline Allen finished her very detailed and critical account of the Panamanian Lauraceae and worked on representatives of the family from northern South America. Dr. Perry continued work on the Papuan flora and started studies on the Chinese flora.

**Bibliography.**—Dr. Frans Verdoorn continued to edit his *Chronica Botanica*, "A New Series of Plant Science Books," and the *Annales Crypto-*



gamici et Phytopathologici, and established a new serial, *Pallas*, for the publication of reprint editions of rare classic scientific works. Volume 1 of *Biologia*, a report of international activities in the biological sciences, was concluded in December 1947. Volume 2 will be issued this autumn as a small annual. Work on the *Index Botanicorum* continued, as in previous years, with two administrative assistants devoting almost full time to this work. The card files, needed before the actual compilation of the *Prodromus* to the *Index* can be started, are now nearing completion.

**The Library.** — During the fiscal year just ended about ninety percent of the pre-Linnaean books were sent to the Houghton Library on temporary deposit (until such time as we shall have better facilities for their storage). The present library space available here for these books is not the best. The upper library gets too hot in summer and too cold in winter, and as a result the old leather bindings suffer greatly. If any of these books are urgently needed, it is a matter of from twenty-four to thirty-six hours for the Harvard messenger to bring the books over from Cambridge. These books are shelved as a unit, in the same order in which they were shelved at the Arboretum. The remaining ten percent are a "must"; they are needed here. The latter have been treated with a leather preservative, and those in need of repair have been repaired and restored by a craftsman.

The resulting empty shelves have enabled the librarian to remedy the overcrowding of other shelves, namely those containing monographs; a job of shelf-reading and dusting accompanied the moving.

There has been some rearrangement of books in the main library. In several sections the books have been given individual numbers, thus making the finding of references much easier for the staff.

We continue to fill the gaps in foreign periodical literature, German as well as Japanese; some through journal exchanges, some through the Library of Congress Mission. We were very fortunate in receiving microfilms of several German periodicals, the originals of which were destroyed during the war.

Interlibrary loans were heavier than in previous years, 685 volumes having been borrowed or loaned; there were also many requests for typed copies of original descriptions, microfilms, and photostats.

The photograph file is being brought up to date, especially that section which deals with the Arnold Arboretum.

There were 248 bound volumes added to the library, bringing the total to 46,765; 185 pamphlets were catalogued and put into pamphlet bindings, and these now total 14,148.

The main catalogue received additions of 825 cards, and the Gray Herbarium cards were increased by 4,629.

A new steel file was acquired for the slips of the Polynesian bibliography.

**Financial report.** — Endowment funds received during the year included \$360,000.00 from the Louisa W. Case estate, \$64,790.91 from the

Georgiana Wells Sargent bequest, and \$10,000.00 from the William Prescott Wolcott bequest. Funds for current use include \$3,000.00 from John S. Ames for the specific project already described, \$400.00 for Chinese Exploration, \$50.00 for the William H. Judd Fund, \$6,680.00 for the Rafinesque Publication Fund, and \$8,583.65 from the "Friends of the Arnold Arboretum" for improvement of the grounds.

The total income for the year was \$170,134.00 and expenses were \$172,428.00. The deficit was greater than indicated because the publication fund and the grant for special work on Peters Hill are to be expended largely during the following year. The deficit during the past three years has amounted to more than \$30,000.00, and has practically wiped out the credit balance built up during the war years. The added endowment and contributions from the Friends of the Arnold Arboretum should permit normal maintenance and operations during the coming year. However, we have not replaced the plant pathologist who retired in 1940, nor the two taxonomists, an assistant librarian and a technician, who retired or resigned last year.

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KARL SAX,  
Director



## Staff of the Arnold Arboretum

1947 — 48

KARL SAX, S.D., Professor of Botany and Director.

IVAN MURRAY JOHNSTON, Ph.D., Associate Professor of Botany and Supervisor of the Library and Herbarium.

JOSEPH HORACE FAULL, Ph.D., Professor of Forest Pathology, Emeritus.

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## INDEX

Synonyms are printed in *italics*; new names in **bold-face** type.

- Acalypha amentacea, 188  
 — hispida, 188  
 — *spiciflora*, 188  
 Acer **bicolor**, 420  
 Achyranthes *hispida*, 188  
 — *spiciflora*, 188  
 Acinophora, 207  
 Acnistus *aggregatus*, 213  
 — *campanulatus*, 213  
 Acroceras *oryzoides*, 267  
 — *zizanioides*, 267  
 Actinea, 210  
 Additional Notes on the Convolvulaceae  
     of New Guinea, 414  
 Adipe, 208  
 Aegilops *exaltata*, 356  
 Agaloma, 208  
 Agastache, 209  
 Agemoron, 209  
 Aglaia **Clemensiae**, 158  
 Agrostis *procera*, 295  
 Aira *spicata*, 282  
 Alifana, 209  
 Alloteropsis, 263, 287  
 — *distachya*, 288  
 — *semialata*, 288  
 Aloemia *villosa*, 212  
 Alyxia *scabrida*, 164  
 Amarolea, 209  
 Amborella trichopoda Baill., a New Morphological Type of Vesselless Dicotyledon, 245  
 Amborella trichopoda Baill., a New Type of Vesselless Dicotyledon, 215  
 Amphicarpon, 207  
 Andropogon, 362  
 — *acicularis*, 359  
 — *aciculatus*, 359  
 — *annulatus*, 368  
 — *aureus*, 333  
 — *australis*, 380  
 — — *laeviramis*, 380  
 — *Baileyi*, 358  
 — *bracteatus*, 370  
 — *breviaristatus*, 338  
 — *brevifolius*, 363  
 — — **cryptopodus**, 363  
 Andropogon *brevifolius paradoxus*, 364  
 — *citreus*, 352  
 — *contortus*, 376  
 — *crinitum*, 339  
 — *cryptopodus*, 363  
 — *distachyus*, 362  
 — *elongatus filipes*, 360  
 — *flexuosus*, 369  
 — *fragilis malayanus*, 363  
 — *Gryllus*, 359  
 — *halepensis propinquus*, 380  
 — *intermedius*, 367  
 — *micranthus*, 365  
 — — **muticispiculus**, 365  
 — *Nardus flexuosus*, 369  
 — *parviflorus*, 365  
 — *procerus*, 369  
 — *pseudograya*, 364  
 — *rottboellioides*, 354  
 — *sanguineus*, 364  
 — *Schoenanthus*, 369  
 — *sericeus*, 367  
 — *serratus*, 357  
 — *Sorghum halepensis alborvillosa*, 358  
 — — — *propinquus*, 380  
 — *spicigerus*, 366  
 — *squarrosus*, 305  
 — *trispicatus*, 333  
 — *tristachyos*, 333  
 — *triticeus*, 376  
 — *tropicus*, 357  
 — *vimineus*, 336  
 Anemopaegma, 209  
 Anginon, 209  
 Anisacanthus, 210  
 Anthacanthus, 210  
 Anthanotis, 209  
 Anthistiria *australis*, 372  
 — *ciliata*, 380  
 — *Forskali*, 372  
 — *frondosa*, 371  
 — *gigantea*, 373  
 — *imberbis*, 372  
 — *vulgaris*, 372  
 Anthoxanthum *giganteum*, 332  
 Aphoma, 207  
 Aphyllon, 210

- Apluda*, 348  
 — *digitata*, 377  
 — *mutica*, 348  
 — *varia mutica*, 348  
*Arachnion*, 207  
*Arcaula*, 208  
*Aristolochia crassinervia*, 153  
 — *dictyophlebia*, 152  
 — *megalophylla*, 153  
 — *tagala*, 153  
 Arnold Arboretum during the Fiscal Year  
 Ended June 30, 1948, The, 422  
 Arnold Arboretum 1947-48, Staff of the,  
 429  
*Arthraxon*, 361  
 — *ciliare*, 362  
 — *hispidus*, 362  
 — *linifolius*, 380  
 — *pallidus*, 380  
*Arthrodia*, 207  
*Asclepias*, 209  
*Asclepiodora*, 209  
*Asterolinon*, 209  
*Astrodaucus*, 209  
*Astronidium*, 209  
*Austrobaileya* (Austrobaileyaceae) from  
 Australia, A New Species of, 255  
*Austrobaileya maculata*, 255  
 — *scandens*, 256  
*Axonopus semialatus*, 288  
*Ayparia crenata*, 212  
*Bacopa*, 209  
 BAILEY, I. W. & CHARLOTTE G. NAST.  
 Morphology and Relationships of *Illium*,  
*Schisandra* and *Kadsura*, I.  
 Stem and Leaf, 77  
 — & B. G. L. SWAMY. *Amborella trichopoda*  
 Baill., a New Morphological  
 Type of Vesselless Dicotyledon, 245  
 — & — *Amborella trichopoda* Baill., a  
 New Type of Vesselless Dicotyledon,  
 215  
*Balanaulax*, 208  
*Balanophora Oosterzeeana*, 152  
*Balanoplis*, 208  
*Bassia latifolia*, 190  
 — *villosa*, 190  
*Baulia*, 207  
*Baumea glomerata*, 97  
 — *mariscoides*, 96  
 — *Meyenii*, 96  
*Beauverdia*, 208  
*Begonia Bartlettiana*, 160  
 — *brachyptera*, 160  
 — *Clemensiae*, 161  
*Benthamia*, 112, 114  
 — subgen. *Apocarpea* sect. *Benthamidia*,  
 112  
 — subgen. *Apocarpea* sect. *Discocrania*,  
 112  
 — subgen. *Syncarpea* sect. *Eubenthamia*,  
 114  
 — *capitata*, 115  
 — *chinensis*, 114  
 — *disciflora*, 113  
 — *florida*, 113  
 — *fragifera*, 115  
 — *grandis*, 113  
 — *hongkongensis*, 115  
 — *japonica*, 114  
 — *exsucca*, 114  
 — *minor*, 114  
 — *sinensis*, 114  
 — *typica*, 114  
 — *Kousa*, 114  
 — *Nuttallii*, 113  
 — *viridis*, 114  
*Benthamidia*, 112, 209  
 — sect. *Cephalocrania*, 114  
 — sect. *Cynoxylon*, 112  
 — *capitata*, 115  
 — *khasiana*, 115  
 — *mollis*, 115  
 — *disciflora*, 113  
 — *floccosa*, 113  
 — *ferruginea*, 115  
 — *florida*, 113  
 — *pendula*, 113  
 — *pendula*, 113  
 — *pluribracteata*, 113  
 — *rubra*, 113  
 — *rubra*, 113  
 — *urbiniiana*, 113  
 — *xanthocarpa*, 113  
 — *hongkongensis*, 114  
 — *gigantea*, 115  
 — *japonica*, 114  
 — *angustata*, 114  
 — *chinensis*, 114  
 — *Nuttallii*, 113  
*Besleria bivalvis*, 213  
 Bibliography of the Published Writings of  
 the Staff and Students July 1, 1947-  
 June 30, 1948, 426  
*Bifrenaria*, 208  
*Bivonea*, 208  
 BLAKE, S. T. The Cyperaceae Collected  
 in New Guinea by L. J. Brass, III, 90  
*Bletia woodfordii*, 211  
*Bletilla*, 208



- Boehmeria decumbens*, 211  
 Bonanox, 209  
 Bonnetia, Studies in the Theaceae, XVII.  
     A Review of the Genus, 393  
 Bonnetia, 394  
   — *anceps*, 404  
   — — *typica*, 404  
   — *bahiensis*, 404  
   — *crassa*, 399  
   — *cubensis*, 403  
   — *Dinizii*, 408  
   — *duidae*, 411  
   — *holostyla*, 400  
   — *lanceifolia*, 412  
   — *longifolia*, 398  
   — *paniculata*, 406  
   — — *parviflora*, 407  
   — — *typica*, 407  
   — *parviflora*, 407  
   — *Phelpsii*, 409  
   — *roraimae*, 396  
   — *sessilis*, 409  
   — *Steyermarii*, 402  
   — *stricta*, 404  
   — *tepuiensis*, 399  
   — *tristyla*, 395  
   — *venulosa*, 401  
 Boraginaceae, XVI. Species Chiefly from  
     Mexico and Western United States,  
     Studies in the, 227  
 Borissa, 209  
*Bothriochloa intermedia*, 367  
   — *parviflora muticispicula*, 365  
 Bourreria *Hintonii*, 228  
   — *longiflora*, 228  
   — *panamensis*, 229  
   — *superba glabra*, 229  
 Brachiaria, 263, 272  
   — *ambigua*, 265  
   — *coccosperma*, 273  
   — *eruciformis*, 273  
   — *fusiformis*, 274  
   — *holosericea*, 275  
   — *miliiforme*, 273  
   — *paspaloides*, 265  
   — *piligera*, 273  
   — *prostrata*, 266  
   — *reptans*, 266  
   — *subquadripa*, 273  
   — — *piligera*, 273  
 Brachygyne, 209  
 Brachyotum, 209  
 Brass, III, The Cyperaceae Collected in  
     New Guinea by L. J., 90  
 Braxilia, 209  
*Bryantea*, 208  
   — *dealbata*, 200  
 Bubalina, 210  
 BUCHHOLZ, JOHN T. & NETTA E. GRAY.  
   A Taxonomic Revision of Podocarpus,  
   I. The Sections of the Genus and their  
   Subdivisions with Special Reference to  
   Leaf Anatomy, 49  
   — & — A Taxonomic Revision of Podo-  
   carpus, II. The American Species of  
   Podocarpus: Section Stachycarpus, 64  
   — & — A Taxonomic Revision of Podo-  
   carpus, III. The American Species of  
   Podocarpus: Section Polypodiopsis, 117  
   — & — A Taxonomic Revision of Podo-  
   carpus, IV. The American Species of  
   Section Eupodocarpus, Sub-Sections C  
   and D, 123  
 Burchellia, 210  
*Calamina*, 348  
*Callitriche verna*, 158  
 Calonyction, 209  
*Caltha auriculata*, 211  
   — *chionophila*, 211  
   — *leptosepala rotundifolia*, 211  
   — *rotundifolia*, 211  
   — *sagittata*, 211  
 Calylophis, 209  
*Capillipedium parviflorum*, 365  
   — *spicigerum*, 366  
 Capparis *urophylla*, 419  
*Carpha alpina*, 93  
   — *arundinacea*, 95  
   — *junciformis*, 98  
   — *Urvilleana*, 95  
 Cartrema, 209  
 Cassia *Absus*, 155  
 Castanopsis, 208  
 Caularthron, 208  
 Cedrela, 208  
 Cenchrus, 262, 307  
   — *Brownii*, 308  
   — *echinatus*, 307  
   — *granularis*, 349  
   — *inflexus*, 308  
   — *viridis*, 308  
*Cestrum campanulatum*, 213  
*Chaetochloa*, 300  
   — *italica*, 302  
   — *palmifolia*, 301  
   — *viridis*, 302  
*Chaetospora axillaris*, 93  
   — *calostachya*, 91  
   — *fimbristylodes*, 98  
*Chamaepericlymenum*, 115

- Chamaeraphis aspera*, 306  
*Chenopodium carinatum*, 154  
*Chimanthus*, 208  
*Chionachne Sclerachne*, 287  
*Chionographis*, 208  
*Chisocheton Weinlandii*, 157  
*Chrysopogon*, 358  
— *aciculatus*, 359  
— *elongatus*, 360  
— *filipes*, 360  
— *filipes*, 360  
— *arundinaceus*, 360  
— *Gryllus*, 359, 380  
CHUN, FAITH. Descriptions of New Chinese Plants, 419  
*Cladium brevipaniculatum*, 97  
— *colpodes*, 96  
— *Gaudichaudii*, 96  
— *globiceps*, 97  
— *colpodes*, 97  
— *glomeratum*, 97  
— *glomeratum*, 97  
— *Gunnii brevipaniculatum*, 97  
— *juncoides*, 97  
— *mariscoides*, 96  
— *Meyenii*, 96  
— *Gaudichaudii*, 96  
— *juncoides*, 97  
— *sinuatum*, 97  
— *undulatum*, 98  
— *fimbristylodes*, 98  
*Cleistochloa*, 263, 286  
— *Sclerachne*, 287  
— *subjuncea*, 287  
*Clematis Gouriana malaiana*, 154  
— *papuasica pubescens*, 154  
— *perspicuinervia*, 155  
— *Pickeringii novo-guineensis*, 154  
— *Vitalba javana*, 154  
Clemens, Notes on Some Papuan Collections of Mary Strong, 152  
*Cleome*, 208  
*Clethra bracteata*, 212  
— *grisebachii*, 212  
*Clitandropsis Clemensiae*, 163  
*Closterium*, 207  
*Cnidoscolus*, 208  
*Coelorachis rottboellioides*, 354  
*Coix*, 378  
— *Lacryma*, 378  
— *stenocarpa*, 379  
— *Lacryma-Jobi*, 378  
— *novoguineensis*, 378  
— *stenocarpa*, 379  
— *tubulosa*, 379  
*Coix stenocarpa*, 379  
— *tubulosa*, 379  
*Colonnaria*, 207  
Control of Destructive Insects in the Herbarium, On the, 103  
Convolvulaceae of New Guinea, Additional Notes on the, 414  
*Cordia coyucana*, 227  
— *passa*, 227  
*Coridochloa*, 287  
— *semialata*, 288  
*Cornus*, 209  
— *Gruppe Benthamidia*, 112  
— *sect. Benthamia*, 112, 114  
— *sect. Benthamidia*, 112  
— *sect. Cephalocrania*, 114  
— *sect. Cynoxylon*, 112  
— *sect. Discocrania*, 112  
— *sect. Involucratae*, 112  
— *sect. Tanycrania*, 112  
— *subgen. Benthamia*, 114  
— *subgen. Benthamidia*, 112  
— *subgen. Cynoxylon*, 112  
— *subgen. Discocrania*, 112  
— *capitata*, 115  
— *hypoleuca*, 115  
— *khasiana*, 115  
— *mollis*, 115  
— *disciflora*, 113  
— *floccosa*, 113, 114  
— *ferruginea*, 115  
— *floccosa*, 113  
— *florida*, 113  
— *pendula*, 113  
— *pluribracteata*, 113  
— *rosea*, 113  
— *rubra*, 113  
— *urbiniana*, 113  
— *xanthocarpa*, 113  
— *grandis*, 113  
— *hongkongensis*, 115  
— *gigantea*, 115  
— *japonica*, 114  
— *Kousa*, 114  
— *angustata*, 114  
— *chinensis*, 114  
— *Nuttallii*, 113  
— *urbiniana*, 113  
*Costularia Urvilleana*, 95  
*Couralia*, 210  
*Couthovia yunzaingensis*, 163  
*Crateola*, 210  
*Crotalaria alata*, 155  
— *chinensis*, 155  
*Cryptantha abata*, 240

- Cryptantha Barnebyi*, 240  
 — *modesta*, 240  
*Cupulissa*, 209  
*Cuthbertia*, 207  
*Cyclobalanopsis*, 208  
*Cyclocampe waigionensis*, 91  
*Cymbopogon*, 368  
 — *bracteatus*, 370  
 — *flexuosus*, 369  
 — *procerus*, 369  
 — *Schoenanthus*, 369  
*Cynoctonum Mitreola*, 163  
 — *oldenlandioides*, 163  
*Cynoxylon*, 112, 209  
 — sect. *Benthamia* subsect. *Japonicae*, 114  
 — *capitata*, 115  
 — *disciflorum*, 113  
 — *floccosum*, 113  
 — *florida*, 113  
 — — *pendulum*, 113  
 — — *rubrum*, 113  
 — *hongkongensis*, 115  
 — *japonica*, 114  
 — — *exsucca*, 114  
 — — *minor*, 114  
 — — *typica*, 114  
 — — *viridis*, 114  
 — *Kousa*, 114  
 — *Nuttallii*, 113  
 — *sinense*, 114  
 Cyperaceae Collected in New Guinea by  
     L. J. Brass, III, The, 90  
*Cypripedium*, 208  
*Cyrtococcum*, 263, 284  
 — *oxyphyllum*, 284  
 — *patens*, 285  
 — — *Warburgii*, 286  
 — *pilipes*, 285  
 — *setigerum*, 284  
 — *trigonum*, 285  
 — *Warburgii*, 286  
*Dacrydium distichum*, 69  
*Dacryomyces*, 207  
*Daedalacanthus*, 210  
*Darbya*, 208  
*Dasistoma*, 209  
*Dasynotus*, 233  
 — *Daubenmirei*, 234  
*Delopyrum*, 208  
*Dendrobenthamia*, 114  
 — *capitata*, 115  
 — *hongkongensis*, 115  
 — *japonica*, 114  
*Deppia*, 208  
*Descantaria*, 207  
 Descriptions of New Chinese Plants, 419  
*Desmodium lasiocarpum*, 156  
 — *latifolium*, 156  
 — *purpureum*, 156  
 — *tortuosum*, 156  
 — *velutinum*, 156  
*Diacrium*, 208  
*Diatremis*, 209  
*Dicanthium annulatum*, 368  
 — *sericeum*, 367  
*Dichoesperma*, 207  
*Dichrophyllum*, 209  
*Dictilema*, 207  
*Digastrum fragile*, 347  
*Digitaria*, 263, 289  
 — *abortiva*, 291  
 — *adscendens*, 291  
 — *Baileyi*, 293  
 — *chinensis*, 294  
 — *consanguinea*, 292  
 — *filiformis*, 381  
 — *fimbriata*, 291  
 — *heterantha pachyrachis*, 290  
 — *longiflora*, 294  
 — *longissima*, 290  
 — *marginata*, 291  
 — *microbachne*, 292  
 — *parviflora*, 383  
 — *perpusilla*, 295  
 — *pruriens*, 292  
 — *radicosa*, 293  
 — *sanguinalis*, 290  
 — *violascens*, 294  
*Dilasia*, 207  
*Dilomilis*, 208  
*Dimeria*, 323  
 — *acinaciformis*, 323  
 — *bialata*, 325  
 — *chloridiformis*, 325  
 — *ciliata*, 325  
 — — *heteromorpha*, 325  
 — *dipteros*, 324  
 — *glabra*, 326  
 — *glabriuscula*, 326  
 — *monostachya*, 324  
 — *ornithopoda*, 326  
*Dioclea reflexa*, 188  
*Dipholis*, 209  
*Discovium*, 208  
*Disgrega*, 207  
*Dissotis villosa*, 212  
 Distribution and Occurrence of White  
     Pine (*Pinus Strobus* L.) and Red Pine  
     (*Pinus resinosa* Ait.) at the Northern  
     Limit of their Range in Ontario, 217

- Dodecatheon *integrifolium*, 212  
 — *meadia pauciflorum*, 212  
 — *pauciflorum*, 212  
 — *pulchellum*, 212  
 Dogwood and its Allies, The Nomenclature of the Flowering, 111  
 Dolichandrone, 210  
*Dolichos giganteus*, 190  
*Drupina cristata*, 213  
*Duval-Jouvea maritima*, 100  
*Dysoxylum intermedium*, 157  
*Echinochloa*, 263, 276  
 — *colonum*, 276  
 — *crusgalli*, 277  
 — *colana*, 276  
 — *stagnina*, 278  
*Echinolaena polystachya*, 284  
*Elaeocarpus crenatus*, 212  
 — *rumphii*, 212  
*Eleiosina*, 208  
*Elisma*, 207  
*Elyonurus*, 352  
 — *citreus*, 352  
 — *papuanus*, 352  
 — *tripsacoides*, 352  
*Entolasia marginata*, 272  
*Epidendrum fervum*, 189  
 — *fervum*, 189  
 — *spathulatum*, 189  
*Eremochloa*, 350  
 — *bimaculata*, 351  
 — *ciliaris*, 351  
 — *elata*, 351  
 — *Horneri*, 351  
*Erianthus*, 331  
 — *arundinaceus*, 332  
 — *fastigiatus*, 332  
 — *giganteus*, 332  
 — *irritans*, 335  
 — *pedicellaris*, 380  
 — *saccharoides*, 332  
 — *sesquimetralis*, 332  
*Eriochloa*, 263, 295  
 — *distachya*, 295  
 — *procera*, 295  
 — *punctata*, 380  
 — *ramosa*, 295  
*Erxlebenia*, 209  
*Erycibe Clemensae*, 414  
 — *floribunda*, 416  
 — *grandiflora*, 416  
 — *Hellwigii*, 414  
 — *nitidula*, 416  
 — *Schlechteri*, 416  
*Esclerona*, 208  
*Etornotus*, 209  
*Eugenia malaccensis*, 192  
 — *nigra*, 192  
*Eulalia*, 329  
*Eulalia*, 333  
 — *argentea*, 333  
 — *aurea*, 333  
 — *glabrata*, 381  
 — *irritans*, 335  
 — *egregeia*, 336  
 — *leptostachys*, 334  
 — *nuda*, 338  
 — *trispicata*, 333  
 — *tristachya*, 334  
*Euphorbia*, 208, 209  
*Euroschinus papuanus*, 158  
*Euscaphis*, 209  
*Evolvulus alsinoides decumbens*, 414  
*Exinia pulchella*, 212  
*Ficus conora*, 189  
 — *peru teregam*, 189  
 — *teregam*, 189  
 — *wassa*, 189  
*Flora Indica*, An Overlooked, 186  
*Frutex urticae foliis et facie* . . . *Niwami*, 211  
*Gahnia aspera*, 99  
 — *javanica*, 98  
 — *longearistata*, 98  
 — *paupercula*, 98, 99  
 — *Sieberiana*, 100  
 — *tetragonocarpa*, 100  
*Galearia*, 208  
*Galeorchis*, 208  
*Gardenia Clemensiae*, 166  
 — *invaginata*, 166  
*Gastronychia*, 208  
*Gaura chinensis*, 161  
*Gemmularia*, 207  
*Germainia*, 374  
 — *capitata*, 375  
 GLASSMAN, S. F. A Survey of the Plants of Guam, 169  
*Glutago*, 208  
*Glycine tomentosa*, 156  
*Gomphotis*, 209  
*Goniocarpus scaber*, 162  
 Gramineae-Panicoideae of New Guinea, The, 257  
 Gramineae subfam. Panicoideae, 257  
 — subfam. Panicoideae tribe Andropogoneae, 262  
 — subfam. Panicoideae tribe Maydeae, 262  
 — subfam. Panicoideae tribe Paniceae, 262



- Grateloupia, 207  
 GRAY, NETTA E. & JOHN T. BUCHHOLZ.  
 A Taxonomic Revision of Podocarpus,  
 I. The Sections of the Genus and  
 their Subdivisions with Special Refer-  
 ence to Leaf Anatomy, 49  
 — & — A Taxonomic Revision of Podo-  
 carpus, II. The American Species of  
 Podocarpus: Section Stachycarpus, 64  
 — & — A Taxonomic Revision of Podo-  
 carpus, III. The American Species of  
 Podocarpus: Section Polypodiopsis, 117  
 — & — A Taxonomic Revision of Podo-  
 carpus, IV. The American Species of  
 Section Eupodocarpus, Sub-Sections C  
 and D, 123  
 Guam, A Survey of the Plants of, 169  
 Gymnothrix, 306  
 — *macrostachys*, 306  
 Gynostemma *pedatum*, 168  
 — *pentaphyllum*, 168  
 Habenaria, 208  
 Hackelia *leonotis*, 239  
 — *longituba*, 237  
 — *Skutchii*, 238  
 — *stricta*, 238  
 Hackelochloa, 207, 349  
 — *granularis*, 349  
 HADDOW, W. R. Distribution and Oc-  
 currence of White Pine (*Pinus Strobus*  
 L.) and Red Pine (*Pinus resinosa* Ait.)  
 at the Northern Limit of their Range  
 in Ontario, 217  
 Haemocharis *anceps*, 404  
 — *stricta*, 404  
 — *venulosa*, 401  
 Haloragis *chinensis*, 161  
 — *sanguinea*, 162  
 — *scabra*, 162  
 — *elongata*, 162  
 Haplachne, 323  
 HARA, HIROSHI. The Nomenclature of  
 the Flowering Dogwood and its Allies,  
 111  
 Hebokia, 209  
 Hecabe *lutea*, 211  
 Hedysarum *lasiocarpum*, 156  
 — *latifolium*, 156  
 — *velutinum*, 156  
 Heliotropium *confertifolium* *coldenio-*  
*ides*, 229  
 — *queretaroanum*, 230  
 — *texanum*, 231  
 — *Wigginsii*, 232  
 Heloniopsis, 207  
 Helothrix *axillaris*, 93  
 — *pusilla*, 93  
 Hemarthria, 349  
 — *compressa*, 350  
 — *subulata*, 350  
 Hemigymnia *Arnottiana*, 266  
 — *fusca*, 267  
 — *multinodis*, 266  
 Hemihabenaria, 208  
 Heminema, 207  
 Hemitria, 208  
 Heteropogon, 375  
 — *contortus*, 376  
 — *hirtus*, 376  
 — *triticeus*, 376  
 Hexonix, 207  
 Holcus, 356  
 — *elongatus*, 360  
 — *fulvus*, 357  
 — *nitidus*, 357  
 — *parviflorus*, 365  
 — *saccharatus*, 357  
 — *spicatus*, 306  
 — *striatus*, 281  
 Hollrungia *aurantioides*, 160  
 Hybrid Oaks of North America. Ernest  
 J. Palmer, 1  
 Hydromycus, 207  
 Hydrotrida, 209  
 Hymenachne, 263, 288  
 — *amplexicaulis*, 289  
 — *aurita*, 268  
 — *myosuroides*, 282  
 Hypogon, 209  
 Hyparrhenia, 370  
 — *bracteata*, 370  
 — *pseudocymbaria*, 370  
 Hypolepis, 207  
 Ichnanthus, 263, 275  
 — *panicoides*, 275  
 — *vicinus*, 275  
 Idanthisa, 210  
 Illicium, Schisandra and Kadsura, I.  
 Stem and Leaf, Morphology and Re-  
 lationships of, 77  
 Imperata, 327  
 — *arundinacea*, 327  
 — — *Koenigii*, 327  
 — *conferta*, 327  
 — *cylindrica*, 327  
 — — *Koenigii*, 327  
 — — *major*, 327  
 — *exaltata*, 328  
 — — *Merrillii*, 328  
 — *Koenigii*, 327

- Imperata Koenigii major*, 327  
 — *spontanea*, 330  
*Iodanthus*, 208  
*Ipheion*, 208  
*Iphigenia*, 207  
*Ipomoea alba*, 418  
 — *aquatica*, 418  
 — *asterophora subglabra*, 418  
 — *congesta*, 417  
 — *gracilis*, 418  
 — *polymorpha*, 417  
*Isachne*, 263, 308  
 — *albans*, 309  
 — *arfakensis*, 310  
 — *australis*, 309  
 — *australis*, 315  
 — *Brassii*, 314  
 — *villosa*, 314  
 — *confusa*, 311  
 — *elatiuscula*, 309  
 — *firma*, 311  
 — *globosa*, 315  
 — *globosa*, 309  
 — *grisea*, 312  
 — *micrantha*, 312  
 — *miliacea*, 315  
 — *Myosotis*, 312  
 — *obtecta*, 313  
 — *pauciflora*, 313  
 — *rhabdina*, 315  
 — *Rhignon*, 311  
 — *Schmidtii*, 311  
 — *semitalis*, 311  
 — *stricta*, 309  
 — *villosa*, 314  
*Ischaemum*, 341  
 — *aristatum*, 342  
 — *arfakense*, 380  
 — *barbatum*, 342, 381  
 — *cylindricum*, 381  
 — *arundinaceum*, 342  
 — *barbatum*, 342  
 — *chordatum*, 381  
 — *digitatum*, 346, 381  
 — *polystachyum*, 346  
 — *foliosum*, 344  
 — *fragile*, 347  
 — *intermedium*, 347  
 — *involutum*, 317  
 — *littorale*, 345  
 — *murinum spiculis majoribus*, 344  
 — *muticum*, 343  
 — *polystachyum*, 346  
 — *pubescens*, 343  
 — *rottboelloides*, 354  
*Ischaemum rugosum*, 381  
 — *truncatiglume*, 340  
 — *Turneri*, 345  
*Jacquemontia paniculata*, 417  
*Jambosa malaccensis*, 192  
*Jasminum sambac*, 189  
*Jatropha*, 208  
*Jimensia*, 208  
 JOHNSTON, IVAN M. Studies in the Boraginaceae, XVI. Species Chiefly from Mexico and Western United States, 227  
*Juniperus rigida*, 141  
 Kadsura, I. Stem and Leaf, Morphology and Relationships of Illicium, Schisandra and, 77  
*Kielmeyera bracteosa*, 404  
 — *Schottii*, 404  
*Kiesera*, 394  
 — *anceps*, 404  
 — *paniculata*, 407  
 — *sessilis*, 409  
 — *venulosa*, 401  
*Kieseria*, 394  
 — *cubensis*, 403  
 — *stricta*, 404  
*Kigelia*, 210  
*Kigelkeia*, 210  
 KOBUSKI, CLARENCE E. Studies in the Theaceae, XVII. A Review of the Genus Bonnetia, 393.  
 Kozola, 207  
*Krynitzkia depressa*, 240  
*Lagurus cylindricus*, 327  
*Lampocarya aspera*, 99  
*Lapithia*, 209  
*Lasiandra villosa*, 212  
*Laurocerasus*, 208  
*Lepadena*, 209  
*Lepidosperma Zeylanicum*, 98  
*Lepistemon urceolatum*, 418  
*Leptatherum*, 336  
*Lesquerella*, 208  
*Liacina*, 207  
*Lindera*, 207  
*Litsea dealbata*, 200  
*Lobonis*, 210  
*Lomanodia*, 209  
*Lophanthus*, 209  
*Lophoschoenus Urvilleanus*, 95  
*Luronium*, 207  
*Lycaste*, 208  
*Lycium aggregatum*, 213  
*Lysimachia japonica papuana*, 162  
*Macrocarpum officinale*, 115  
*Macromeria guatemalensis*, 232

- Madhuca indica*, 190  
 — *latifolia*, 190  
*Mahonia subimbricata*, 420  
*Máhwa*, 190  
*Mahwah hamiltonia*, 190  
*Maniltoa lenticellata*, 155  
*Manisuris*, 349  
 — *exaltata*, 353  
 — *granularis*, 349  
 — *rottboellioides*, 354  
*Mariscus colpodes*, 97  
 — *globiceps*, 97  
 Maydeae, Family Gramineae, 376  
*Meadia pauciflora*, 212  
*Melastoma saigonense*, 212  
 — *villosum*, 212  
*Melinis*, 263, 318  
 — *minutiflora*, 318  
*Melothria Clemensiae*, 168  
 — *filipes*, 167  
 — *morobensis*, 167  
*Mendoncia bivalvis*, 213  
 — *perrottetiana*, 213  
*Meoschium*, 341  
*Meriolix*, 209  
*Merremia gemella*, 417  
 — *quinata*, 417  
 MERRILL, E. D. A Note on Philip Miller's Binomials, 242  
 — An Overlooked Flora Indica, 186  
 — Neolitsea (Bentham) Merrill, Nomen Conservandum Propositum, 198  
 — Nomenclatural Notes on Rafinesque's Published Papers, 1804-1840, 202  
 — On the Control of Destructive Insects in the Herbarium, 103  
 — & L. M. PERRY. Notes on Some Papuan Collections of Mary Strong Clemens, 152  
 Micheliella, 209  
 Microdictyon, 207  
 Microstegium, 336  
 — *breviaristatum*, 338  
 — *calochloum*, 381  
 — *ciliatum*, 337  
 — — *latifolium*, 338  
 — — *laxum*, 338  
 — *glabratum*, 381  
 — *nudum*, 338  
 — *pleiostachyum*, 337  
 — *spectabile*, 337  
 — *vimineum*, 336  
 — *Willdenowianum*, 336  
*Milium globosum*, 315  
 — *ramosum*, 295  
*Mioptrila*, 208  
*Miscanthus*, 329  
 — *floridulus*, 329  
 — *japonicus*, 329  
*Mitreola petiolata*, 163  
*Montrichardia*, 207  
*Morisia Wallichii*, 100  
 Morphology and Relationships of Illium, Schisandra and Kadsura, I. Stem and Leaf, 77  
*Mucuna Clemensiae*, 156  
 — *gigantea*, 190  
*Murdannia*, 207  
*Nageia coriacea*, 128  
 — *montana*, 69  
*Nardus ciliaris*, 351  
 NAST, CHARLOTTE G. & I. W. BAILEY. Morphology and Relationships of Illium, Schisandra and Kadsura, I. Stem and Leaf, 77  
 Naudiniella, 209  
 Neocleome, 208  
 Neolitsea (Bentham) Merrill, Nomen Conservandum Propositum, 198  
 Neolitsea, 198, 208  
 — *acuminata*, 200  
 — *acuta*, 200  
 — *Clarissae*, 200  
 — — *pulchra*, 200  
 — *dealbata*, 200  
 — *glabra*, 201  
 — *longifolia*, 201  
 — *Melchioriana*, 201  
 — *minor*, 201  
 — *novo-guinensis*, 201  
 — *papuana*, 201  
 — *pubescens*, 201  
*Neonauclea Clemensiae*, 164  
 Nestronia, 208  
*Neurachne Peekelii*, 282  
 New Guinea, Additional Notes on the Convolvulaceae of, 414  
 New Guinea by L. J. Brass, III, The Cyperaceae Collected in, 90  
 New Guinea, The Gramineae-Panicoideae of, 257  
 New Species of Austrobaileya (Austrobaileyaaceae) from Australia, A, 255  
*Nirvamia pellucida*, 211  
 Nomenclatural Notes on Rafinesque's Published Papers, 1804-1840, 202  
 Nomenclature of the Flowering Dogwood and its Allies, The, 111  
 Note on Philip Miller's Binomials, A, 242  
 Notes on Some Papuan Collections of

- Mary Strong Clemens, 152  
*Nyctanthes arbor sambac*, 189  
 — *sambac*, 189  
 Oaks of North America, Hybrid. Ernest  
   J. Palmer, 1  
*Oclorosis*, 208  
*Octadesmia*, 208  
*Odontia*, 207  
*Odontium*, 207  
*Oenothera*, 209  
*Operculina Turpethum*, 417  
*Ophiorrhiza Mitreola*, 163  
*Ophiuros*, 355  
 — *corymbosus*, 356  
 — *exaltatus*, 356  
 — *pubescens*, 355  
*Oplismenus*, 263, 278  
 — *africanus*, 279  
 — *aristulatus*, 279  
 — *colonus*, 276  
 — *compositus*, 279  
 — *hirtellus*, 279  
*Oplonia*, 210  
*Oreobolus ambiguus*, 96  
 — *Clemensiae*, 95  
 — *pumilio*, 95  
*Oreocarya depressa*, 240  
*Ornithocephalochloa*, 317  
 — *arenicola*, 317  
*Orobanche*, 210  
*Orthilia*, 209  
*Orthopogon*, 278  
*Oryctanthus*, 208  
*Osbeckia saigonensis*, 212  
*Osmanthus*, 209  
*Otophylla*, 209  
*Ottochloa Arnottiana*, 266  
 — *fusca*, 267  
 — *nodosa*, 266  
 Overlook Flora Indica, An, 186  
*Pachyma*, 207  
 PALMER, ERNEST J. Hybrid Oaks of  
   North America, 1  
*Panicum*, 263, 264  
 — sect. *Brachiaria*, 272  
 — sect. *Pseudechinolaena*, 283  
 — *accrescens*, 285  
 — *adscendens*, 290  
 — *albens*, 309  
 — *ambiguum*, 265  
 — *amplexicaule*, 289  
 — *Archboldii*, 271  
 — *Arnottianum*, 266  
 — *asperum*, 305  
 — *auritum*, 267  
*Panicum Baileyi*, 293  
 — *Braunii*, 270  
 — *brevifolium*, 381  
 — *caesium*, 268  
 — *canbogiense*, 268  
 — *carinatum*, 285  
 — *coccospermum*, 273  
 — *colonum*, 276  
 — *compositum*, 279  
 — *contractum*, 282  
 — *creperum*, 267  
 — *cruciabile*, 268  
 — *crusgalli*, 277  
 — *distans*, 265  
 — *eruciforme*, 273  
 — *filiforme*, 381  
 — *foliosum*, 382, 383  
 — *gibbum*, 281  
 — *hermaphroditum*, 284  
 — *heteranthum pachyrachis*, 290  
 — *hirtellum*, 279  
 — *holosericeum*, 275  
 — *incomtum*, 271  
 — *indicum*, 282  
 — *interruptum*, 382  
 — *italicum*, 302  
 — *longiflorum*, 294  
 — *macrocladum*, 270  
 — *marginatum*, 272  
 — *Melinis*, 318  
 — *microbachne*, 292  
 — *miliaceum*, 264  
 — *miliiforme*, 273  
 — *mindanaense*, 269  
 — *pilosum*, 270  
 — *multinode*, 266, 382  
 — *Myosotis*, 312  
 — *myosuroides*, 281  
 — *nervosum*, 301  
 — *neurodes*, 301  
 — *nitens*, 275  
 — *nodosum*, 266  
 — *oryzoides*, 267  
 — *oxyphyllum*, 284  
 — *pallide-fuscum*, 303  
 — *palmaefolium*, 301  
 — *palmifolium*, 301  
 — *paludosum*, 268  
 — *papuanum*, 383  
 — *parviflorum*, 383  
 — *patens*, 285  
 — *parvulum*, 286  
 — *Warburgii*, 286  
 — *phleiforme*, 282  
 — *piligerum*, 273



- Panicum pilipes*, 284  
 — *plicatum*, 383  
 — *prostratum*, 266  
 — *pruriens*, 292  
 — *radicans*, 285  
 — *radicosum*, 293  
 — *reptans*, 265  
 — *reticulatum*, 268  
 — *sanguinale*, 290  
 — — *microbachne*, 292  
 — *sarmentosum*, 271  
 — *semialatum*, 288  
 — *setigerum*, 284  
 — *stagninum*, 278  
 — *subjunceum*, 287  
 — *subquadruparum*, 273  
 — *sulcatum*, 301  
 — *trachyrachis*, 383  
 — *trigonum*, 285  
 — *uncinatum*, 284  
 — *viale*, 269  
 — *vicinum*, 275  
 — *violascens*, 294  
 — *virgatum*, 383  
 — *viride*, 302  
 — *Warburgii*, 286  
 — *zizanioides*, 267  
 Papuan Collections of Mary Strong  
 Clemens, Notes on Some, 152  
 Paronychia, 208  
 Parsonsia Brassii, 164  
 — *buruensis*, 164  
 Pasania, 208  
*Paspalidium distans*, 265  
 Paspalum, 263, 296  
 — *carinatum*, 285  
 — *cartilagineum*, 298  
 — *chinensis*, 294  
 — *cognatum*, 300  
 — *conjugatum*, 297  
 — *distichum littorale*, 297  
 — *flexuosum*, 300  
 — *littorale*, 297  
 — *longiflorum*, 294  
 — *longifolium*, 300  
 — — *trichocoleum*, 300  
 — *miliare*, 383  
 — *minutiflorum*, 294  
 — *orbiculare*, 299  
 — *paniculatum*, 298  
 — *parviflorum*, 383  
 — *scrobiculatum*, 298  
 — — *bispicatum*, 299  
 — — *longifolium*, 300  
 — — *orbiculare*, 299  
*Paspalum scrobiculatum philippinensis*, 300  
 — *vaginatum*, 297  
 — *virgatum*, 296  
 — *Zollingeri*, 298  
 Pecteilis, 208  
*Pectinaria*, 350  
*Pellionia pellucida*, 211  
 — *scabra*, 211  
*Penicillaria*, 306  
*Pennisetum*, 262, 306  
 — *cenchroides*, 383  
 — *ciliare*, 383  
 — *italicum*, 302  
 — *macrostachyum*, 306  
 — *spicatum*, 306  
 — *typhoideum*, 306  
*Perderlea agregata*, 213  
 — *cestroides*, 213  
 PERRY, L. M. & E. D. MERRILL. Notes  
 on Some Papuan Collections of Mary  
 Strong Clemens, 152  
 Perularia, 208  
 Perytis, 208  
 Phaeneilema, 207  
 Phaiophleps, 208  
 Phaius *maculatus*, 211  
 — *woodfordii*, 211  
*Phalaris hispida*, 361, 362  
 Pharbitis, 209  
*Phaseolus lobus litoralis*, 190  
 — *parana rubra*, 188  
 Phoracis, 207  
 Phthirusa, 208  
 Phyllepidum, 208  
 Phydina, 207  
*Picria surinamensis*, 213  
 Picrococcus, 209  
 Piloblephus, 209  
*Piper arborescens*, 191  
 — *macropiper*, 191  
 — *miniatum*, 191  
 Pithecoctenium, 210  
 Plagidia, 208  
 Planchonella, 209  
 Planchonia papuana, 161  
 Platolaria, 209  
 Pleinta, 209  
*Plerona villosum*, 212  
 Pleuropsa, 207  
 Podocarpus, I. The Sections of the  
 Genus and their Subdivisions with Special  
 Reference to Leaf Anatomy, A  
 Taxonomic Revision of, 49  
 Podocarpus, II. The American Species  
 of Podocarpus: Section Stachycarpus,

- A Taxonomic Revision of, 64
- Podocarpus, III. The American Species of Podocarpus: Section Polypodiopsis, A Taxonomic Revision of, 117
- Podocarpus, IV. The American Species of Section Eupodocarpus, Sub-Sections C and D, A Taxonomic Revision of, 123
- Podocarpus, 54
- sect. *Afrocarpus*, 57
  - sect. *Dacrycarpus*, 56
  - sect. *Dacrycarpus*, 56
  - sect. *Eupodocarpus*, 58, 124
  - sect. *Microcarpus*, 56
  - sect. *Nageia*, 56
  - sect. *Nageia*, 57
  - sect. *Polypodiopsis*, 57
  - sect. *Stachycarpus*, 58
  - sect. *Stachycarpus*, 57
  - sect. *Sundacarpus*, 57
  - sect. *Taxoideae*, 57
  - subgen. *Protopodocarpus* sect. *Nageia*, 57
  - subgen. *Stachycarpus*, 57
  - subgen. *Stachycarpus* sect. *Nageia*, 57
  - *Allenii*, 137
  - *andinus*, 65
  - *angustifolia*, 142
  - *angustifolia*, 147
  - — *Wrightii*, 147, 148
  - *angustifolius*, 145
  - *antillarum*, 128
  - *aristulatus*, 147
  - *Buchii*, 148
  - — *latifolius*, 148
  - *Cardenasii*, 142
  - *chilinus*, 143
  - *coriaceus*, 128
  - *coriaceus*, 130, 131, 135, 137
  - *Ekmanii*, 147
  - *glomeratus*, 141
  - *glomeratus*, 144
  - *guatemalensis*, 136
  - — *Allenii*, 137
  - — *pinetorum*, 137
  - *guatemalensis*, 131
  - *Harmsianus*, 66
  - *Harmsianus*, 69, 71
  - *Humboldtii*, 69
  - *Lambertii*, 145
  - — *transiens*, 145
  - *Leonii*, 146
  - *macrostachyus*, 140
  - *magnifolius*, 133
  - *Matudai*, 131

- Podocarpus Matudai macrocarpus*, 132
- *montanus*, 69
  - — *densifolius*, 70
  - — *diversifolius*, 69
  - — *meridensis*, 71
  - *montanus*, 67, 71, 72, 119
  - *nubigenus*, 149
  - *oleifolius*, 139
  - — *costaricensis*, 140
  - — *macrostachyus*, 140
  - — *trujillensis*, 141
  - *Parlatorei*, 142
  - *pendulifolius*, 138
  - *pinetorum*, 137
  - *Pittieri*, 130
  - *Purdianus*, 135
  - *Purdianus*, 147
  - — *parvifolia*, 147
  - *Reichei*, 131
  - *Roraimae*, 132
  - *Rospigliosii*, 119
  - *Rusbyi*, 134
  - *salicifolia*, 128
  - *salicifolius*, 134
  - *salignus*, 143
  - *Selloi*, 129
  - *Sellowii*, 129
  - — *angustifolius*, 130
  - *spicata*, 65
  - *Sprucei*, 144
  - *Standleyi*, 72
  - *Steyermarkii*, 133
  - *taxifolia*, 69
  - — *densifolia*, 70
  - *tepuiensis*, 134
  - *trinitensis*, 135
  - *Urbanii*, 137
  - *utilior*, 67
  - *valdiviana*, 65
  - *Victorinianus*, 146
  - *Yacca*, 137
- Pogonatherum*, 338
- *crinitum*, 339
  - *panicum*, 339
  - *saccharoideum*, 339
- Pollinia*, 336, 358
- sect. *Eulalia*, 333
  - subgen. *Eulalia*, 333
  - *argentea*, 334
  - *calochloa*, 381
  - *ciliaris*, 362
  - *ciliata*, 338
  - — *laxa*, 338
  - *Cumingii*, 334
  - *glabrata*, 381

- Pollinia irritans*, 335  
 — *laxa*, 338  
 — *leptantha*, 334  
 — *leptostachys*, 334  
 — *nuda*, 338  
 — *pleiostachya*, 337  
 — *spectabilis*, 337  
*Polyalthia longifolia*, 191  
*Polycodium*, 209  
*Polygonella*, 208  
*Polygonum attenuatum*, 154  
*Polytoca*, 377  
 — *barbata*, 377  
 — *digitata*, 377  
 — *macrophylla*, 377  
 — *Sclerachne*, 287  
*Pongelia*, 210  
*Potamoxyton*, 210  
*Pothos chinensis*, 210  
 — *scandens*, 210  
 — *seemannii*, 210  
*Prionostachys*, 207  
*Prumnopitys*, 58  
 — *elegans*, 65  
 — *taxifolia*, 69  
*Prunus*, 208  
*Pseudechinolaena*, 263, 283  
 — *polystachya*, 284  
*Pseudopogonatherum irritans*, 335  
*Pseudoraphis*, 262, 305  
 — *aspera*, 306  
 — *Brunoniana*, 305  
 — *squarrosa*, 305  
*Psychrophila auriculata*, 211  
*Ptilepeda*, 210  
*Pueraria textilis*, 156  
*Pycnothymus*, 209  
*Pyrola*, 209  
*Pyrrhemia*, 207  
*Quercus agrifolia* × *Kelloggii*, 26  
 — *alba* × *bicolor*, 31  
 — *alba* × *lyrata*, 45  
 — *alba* × *macrocarpa*, 17  
 — *alba* × *Michauxii*, 16  
 — *alba* × *minor*, 25  
 — *alba* × *montana*, 40  
 — *alba* × *Muhlenbergii*, 22  
 — *alba* × *prinoides*, 25  
 — *alba* × *Prinus*, 16, 40  
 — *alba* × *robur*, 18  
 — *alba* × *stellata*, 25  
 — *anceps*, 14  
 — *Andrewsii*, 14  
 — *aquatica* × *nigra*, 41  
 — *arizonica* × *grisea*, 36  
*Quercus Asheana*, 15  
 — *Ashei*, 15  
 — *atlantica*, 15  
 — *Beadlei*, 16  
 — *beaumontiana*, 16  
 — *Bebbiana*, 17  
 — *Benderi*, 17  
 — *bernardensis*, 18  
 — *bicolor* × *lyrata*, 30  
 — *bicolor* × *macrocarpa*, 30  
 — *bicolor* × *montana*, 45  
 — *bicolor* × *robur*, 45  
 — *bicolor* × *stellata*, 43  
 — *bicolor* × *virginiana*, 35  
 — *bimundorum*, 18  
 — *blufftonensis*, 19  
 — *borealis* × *coccinea*, 17  
 — *borealis* × *ellipsoidalis*, 45  
 — *borealis* × *ilicifolia*, 25  
 — *borealis* × *imbricaria*, 39  
 — *borealis* × *marilandica*, 45  
 — *borealis* × *Phellos*, 29  
 — *borealis* × *velutina*, 28  
 — *brevifolia* × *Catesbaei*, 15  
 — *breviloba* × *stellata*, 34  
 — *Brittoni*, 19  
 — *burnetensis*, 19  
 — *Bushii*, 19  
 — *Byersi*, 20  
 — *caduca*, 20  
 — *Capesii*, 20  
 — *carolinensis*, 22  
 — *Catesbaei* × *laurifolia*, 34  
 — *cinerea* × *aquatica*, 20  
 — *cinerea* × *Catesbaei*, 15  
 — *cinerea* × *laurifolia*, 42  
 — *cinerea* × *nigra*, 22  
 — *clivicola* × *glaucophylla*, 37  
 — *coccinea rubra*, 17  
 — *coccinea* × *ilicifolia*, 38  
 — *coccinea* × *palustris*, 45  
 — *Cocksii*, 21  
 — *coloradensis*, 19  
 — *Comptonae*, 21  
 — *cravenensis*, 22  
 — *Deami*, 22  
 — *Demarei*, 23  
 — *Douglasii* × *Garryana*, 23  
 — *Douglasii* × *lobata*, 31  
 — *dubia*, 15, 25, 38  
 — *dumosa* × *lobata*, 43  
 — *Durandii* × *lyrata*, 45  
 — *Durandii* × *stellata*, 33  
 — *Durandii* × *virginiana*, 45  
 — *Durandii* × *virginiana*, 27

*Quercus Egglestoni*, 23

- *ellipsoidalis* × *velutina*, 36
- *Emoryi* × *hypoleucoides*, 30
- *Eplingi*, 23
- *exacta*, 24
- *falcata* *pagodaeifolia*, 32
- — *subintegra*, 42
- *falcata* × *imbricaria*, 14
- *falcata* × *laevis*, 19
- *falcata* × *marilandica*, 45
- *falcata* × *nigra*, 45
- *falcata* × *nigra*, 27
- *falcata* × *obtusata*, 16
- *falcata* × *Phellos*, 32
- *falcata* × *Shumardii*, 31
- *falcata* × *velutina*, 45
- *fallax*, 24
- *Faxonii*, 25
- *Fernaldi*, 25
- *Fernowii*, 25
- *filialis*, 25
- *Ganderi*, 26
- *garlandensis*, 27
- *geminata* × *Margaretta*, 27
- *georgiana* × *marilandica*, 41
- *georgiana* × *nigra*, 41
- *Giffordii*, 27
- *guadalupensis*, 27
- *Harbisonii*, 27
- *Hastingsii*, 28
- *Hawkinsii*, 28
- *heterophylla*, 29
- *Hillii*, 30
- *humidicola*, 30
- *hypoleucoides* × *Shumardii*, 45
- *ilicifolia* × *coccinea*, 38
- *ilicifolia* × *marilandica*, 19
- *ilicifolia* × *Phellos*, 27
- *ilicifolia* × *velutina*, 37
- *imbricaria* × *marilandica*, 43
- *imbricaria* × *palustris*, 24
- *imbricaria* × *Shumardii*, 23
- *imbricaria* × *Shumardii* *Schneckii*, 23
- *imbricaria* × *velutina*, 32
- *inaequalis*, 25
- *incana* × *falcata*, 42
- *incana* × *laevis*, 15
- *incana* × *laurifolia*, 42
- *incana* × *marilandica*, 22
- *incana* × *myrtifolia*, 36
- *incana* × *nigra*, 20
- *incana* × *obtusata*, 15
- *incana* × *Phellos*, 45
- *incana* × *velutina*, 37
- *incomita*, 19

*Quercus inconstans*, 30

- *Jackiana*, 31
- *jolonensis*, 31
- *Joorii*, 31
- *Kelloggii* × *agrifolia oxyadenia*, 26
- *Kelloggii* × *Wislezani*, 34
- *laevis* × *laurifolia*, 34
- *laevis* × *nigra*, 45
- *laevis* × *nigra*, 44
- *Leana*, 32
- *livermorensis*, 30
- *ludoviciana*, 32
- — *microcarpa*, 33
- — *subfalcata*, 32
- *lyrata* × *stellata*, 42
- *lyrata* × *virginiana*, 21
- *macnabiana*, 33
- *macrocarpa* × *Muhlenbergii*, 24, 30
- *macrocarpa* × *Prinus*, 20
- *macrocarpa* × *robur*, 45
- *macrocarpa* × *stellata*, 27
- *macrocarpa* × *undulata*, 14
- *macrocarpa* × *virginiana*, 19
- *Mahloni*, 34
- *Margaretta* × *stellata*, 37
- *marilandica texana*, 28
- *marilandica* × *nigra*, 41
- *marilandica* × *Phellos*, 38
- *marilandica* × *rubra*, 19
- *marilandica* × *Shumardii*, 28
- *marilandica* × *velutina*, 19
- *Mellichampi*, 34
- *Michauxii* × *macrocarpa*, 20
- *montana* × *robur*, 39
- *montana* × *stellata*, 18
- *moreha*, 34
- *Morehus*, 34
- *moultonensis*, 35
- *mutabilis*, 35
- *neopalmeri*, 35
- *neo-tharpii*, 27
- *Nessiana*, 35
- *nigra* × *ilicifolia*, 19
- *nigra* × *Phellos*, 20
- *nigra* × *rubra*, 27
- *nigra* × *Shumardii*, 35
- *nigra* × *velutina*, 23
- *Nuttallii* × *Shumardii*, 45
- *obtusata* × *velutina*, 21
- *organensis*, 36
- *oviedoensis*, 36
- *pagodaeifolia*, 32
- *pagodaeifolia* × *Phellos*, 32
- *paleolithicola*, 36
- *palustris* × *Phellos*, 40



- Quercus palustris*  $\times$  *Shumardii*, 35  
 — *palustris*  $\times$  *velutina*, 44  
 — *pastorensis*, 37  
 — *petiolaris*, 37  
 — *Phellos microcarpa*, 33  
 — *Phellos*  $\times$  *Shumardii*, 35  
 — *Phellos*  $\times$  *velutina*, 25  
 — *podophylla*, 37  
 — *Porteri*, 28  
 — *prinoides*  $\times$  *stellata*, 41  
 — *pseudomargaretta*, 37  
 — *Rehderi*, 37  
 — *rhombica*  $\times$  *rubra*, 16  
 — *Richteri*, 38  
 — *Robbinsii*, 38  
 — *rubra runcinata*, 39  
 — *Rudkini*, 38  
 — *runcinata*, 39  
 — *Sargentii*, 39  
 — *Saulii*, 40  
 — *Schochiana*, 40  
 — *Schuettei*, 30  
 — *Shirlingii*, 23  
 — *sinuata*, 44  
 — *Smallii*, 41  
 — *stellata aranciosa*, 37  
 — *stellata*  $\times$  *virginiana*, 27  
 — *stellata Margaretta*  $\times$  *virginiana geminata*, 27  
 — *stelloides*, 41  
 — *sterilis*, 41  
 — *Sterretti*, 42  
 — *subfalcata*, 32  
 — — *microcarpa*, 33  
 — *subintegra*, 42  
 — *sublaurifolia*, 42  
 — *substellata*, 43  
 — *Sudworthi*, 45  
 — *tinctoria Willdenowiana*, 45  
 — *Townei*, 43  
 — *tridentata*, 43  
 — *vaga*, 44  
 — *venulosa*, 44  
 — *Walteriana*, 44  
 — *Willdenowiana*, 45  
 Rafinesque's Published Papers, 1804–1840,  
 Nomenclatural Notes on, 202  
 Ramischia, 209  
 Randia Bartlettiana, 165  
 Ranunculus Keysseri, 155  
 Red Pine (*Pinus resinosa* Ait.) at the  
 Northern Limit of their Range in On-  
 taria, Distribution and Occurrence of  
 White Pine (*Pinus Strobus* L.) and,  
 217  
 REEDER, JOHN R. The Gramineae-Pani-  
 coideae of New Guinea, 257  
 Remirea maritima, 100  
 — — *pedunculata*, 100  
 — *pedunculata*, 100  
 Rhaphis, 358  
 — *acicularis*, 359  
 — *aciculatus*, 359  
 — *elongatus*, 360  
 — *trivialis*, 359  
 Rhus lamprocarpa, 159  
 Rhynchosia minima, 157  
 Rhynchospora aurea, 101  
 — *Brownii*, 102  
 — *chinensis*, 102  
 — *corymbosa*, 101  
 — *glauca chinensis*, 102  
 — *heterochaeta*, 101  
 — *laxa*, 102  
 — *rubra*, 100  
 — *triflora*, 101  
 — *Wallichiana*, 100  
 Rhyticarpus, 209  
 Rottboellia, 353  
 — *brevis*, 384  
 — *Coelorachis*, 384  
 — *compressa*, 350  
 — *corymbosa*, 356  
 — *exaltata*, 353  
 — *ophiuroides*, 354  
 — *rariflora*, 355  
 — *rottboellioides*, 354  
 — *sanguinea*, 364  
 Rytilix, 207  
 Rytilix, 349  
 Sabadilla, 208  
 Sabatia, 209  
 Saccharum, 329  
 — *arundinaceum*, 332  
 — *confertum*, 327  
 — *edule*, 331  
 — *fastigiatum*, 332  
 — *floridulum*, 329  
 — *irritans*, 335  
 — *Koenigii*, 327  
 — *macilentum*, 328  
 — *officinatum*, 329, 331  
 — *paniceum*, 339  
 — *robustum*, 330  
 — *sinense*, 331  
 — *spontaneum*, 330  
 — — *edulis*, 331  
 Sacciolepis, 263, 281  
 — *contracta*, 282  
 — *indica*, 282

- Sacciolepis myosuroides*, 281  
 — *striata*, 281  
*Satureia*, 209  
*Saxe-Gothaea gracilis*, 149  
*Schisandra* and *Kadsura*, I. Stem and Leaf, Morphology and Relationships of *Illicium*, 77  
*Schizachyrium brevifolium*, 363  
 — *paradoxum*, 364  
 — *paradoxum*, 364  
 — *sanguineum*, 364  
*Schoenocaulon*, 208  
*Schoenus axillaris*, 93  
 — *calostachyus*, 91  
 — *curvulus*, 91  
 — *falcatus*, 90  
 — *fimbristylloides*, 98  
 — *foliatus*, 93  
 — *laevinus*, 91  
 — *melanostachyus laevinus*, 91  
 — *punctatus*, 90  
 — *ruber*, 100  
 — *setiformis*, 92  
 — *sparteus*, 90  
 — *subaxillaris*, 93  
 — *tendo laevinus*, 91  
*Scirpus corymbosus*, 101  
 — *foliatus*, 93  
*Sclerandrium*, 340  
 — *truncatiglume*, 340  
*Senkenbergia debilis*, 213  
*Sererea*, 210  
*Setaria*, 262, 300  
 — *aurea*, 384  
 — *italica*, 302  
 — *montana*, 304  
 — *pallide-fusca*, 303  
 — *palmaefolia*, 301  
 — *surgens*, 304  
 — *verticillata*, 384  
 — *viridis*, 302  
*Sibiraea*, 208  
*Siderasis*, 207  
*Siraitos*, 208  
*Skoinolon*, 208  
*Sorghum*, 356  
 — *dochna*, 357  
 — *fulvum*, 357  
 — *laxiflorum*, 358  
 — *nitidum*, 357  
 — *saccharatum*, 357  
 — *serratum*, 357  
 — *tropicum*, 357  
*Spinifex*, 262, 316  
 — *littoreus*, 316  
*Spinifex littoreus longifolius*, 316  
 — *longifolius*, 316  
 — *squarrosus*, 316  
*Spodiopogon chordatum*, 381  
*Spondogona*, 209  
*Stachycarpus*, 57, 58  
 — *andina*, 65  
 — *taxifolia*, 69  
 Staff of the Arnold Arboretum 1947–48, 429  
*Stegosa*, 353  
 — *exaltata*, 353  
*Steirotis*, 208  
*Stenotaphrum subulatum*, 384  
*Stipa littorea*, 316  
 — *spinifex*, 316  
*Streptylis*, 207  
*Struthanthus*, 208  
 Studies in the Boraginaceae, XVI. Species Chiefly from Mexico and Western United States, 227  
 Studies in the Theaceae, XVII. A Review of the Genus *Bonnetia*, 393  
 Survey of the Plants of Guam, A, 169  
 SWAMY, B. G. L. & I. W. BAILEY. *Amborella trichopoda* Baill., a New Morphological Type of Vesselless Dicotyledon, 245  
 — & — *Amborella trichopoda* Baill., a New Type of Vesselless Dicotyledon, 215  
*Symphyostemon*, 208  
*Syntherisma*, 289  
 — *chinensis*, 294  
 — *fimbriata*, 291  
 — *longiflora*, 294  
 — *marginata*, 291  
 — *microbachne*, 292  
 — *pruriens*, 292  
 — *sanguinalis*, 291  
*Syzygium malaccense*, 192  
*Tapanava chinensis*, 210  
*Tarenaya*, 208  
 Taxonomic Revision of *Podocarpus*, I. The Sections of the Genus and their Subdivisions with Special Reference to Leaf Anatomy, A, 49  
 Taxonomic Revision of *Podocarpus*, II. The American Species of *Podocarpus*: Section *Stachycarpus*, A, 64  
 Taxonomic Revision of *Podocarpus*, III. The American Species of *Podocarpus*: Section *Polypodiopsis*, A, 117  
 Taxonomic Revision of *Podocarpus*, IV. The American Species of Section *Eu-*

- podocarpus, Sub-Sections C and D, A, 123
- Taxus lancifolia*, 128
- *montana*, 69
- *spicata*, 65
- Tetradenia acuminata*, 200
- *acuta*, 200
- *Clarissae*, 200
- *glabra*, 201
- *latifolia*, 201
- *longifolia*, 201
- *Melchioriana*, 201
- *minor*, 201
- *novo-guinensis*, 201
- *pubescens*, 201
- Tetranthera dealbata*, 200
- Tetraneuris*, 210
- Thalesia*, 210
- Thaumastochloa*, 354
- *pubescens*, 355
- *rariflora*, 355
- Theaceae, XVII. A Review of the Genus Bonnetia, Studies in the, 393
- Themeda*, 371
- *arguens*, 371
- *australis*, 372
- *Forskali*, 372
- *frondosa*, 371
- *gigantea*, 373
- — *amboinensis*, 373
- — *novoguineensis*, 374
- *triandra*, 372, 380
- Thryptomene*, 209
- Thuarea*, 263, 317
- *involuta*, 317
- *sarmentosa*, 317
- Tithymalopsis*, 208
- Tolypella*, 207
- Tomanthera*, 209
- Toona*, 208
- Torreya Humboldtii*, 69
- Tradescantella*, 207
- Trichosanthes*, 192
- *amara*, 192
- *anguina*, 192
- *cucumerina*, 192
- *nervifolia*, 192
- Tricostularia fimbristylodes*, 98
- Trigosanthes*, 192
- *amara*, 192
- *anguina*, 192
- *cucumerina*, 192
- *nervifolia*, 192
- *nervifolia*, 192
- Tripogandra*, 207
- Tristegis*, 318
- *glutinosa*, 318
- Tucahus*, 207
- Tulotis*, 208
- Upudalia*, 210
- Urochloa ambigua*, 265
- *paspaloides*, 265
- *reptans*, 266
- *semialata*, 288
- Uvaria altissima*, 191
- *longifolia*, 191
- Vaccinium*, 209
- VAN OOSTSTROOM, S. J. Additional Notes on the Convolvulaceae of New Guinea, 414
- Vanda furva*, 189
- *spathulata*, 189
- Vetiveria filipes*, 360
- *elongata*, 360
- Vitis pentaphylla*, 168
- Vleckia*, 209
- WHITE, C. T. A New Species of *Austrobaileya* (Austrobaileyaceae) from Australia, 255
- White Pine (*Pinus Strobus* L.) and Red Pine (*Pinus resinosa* Ait.) at the Northern Limit of their Range in Ontario, Distribution and Occurrence of, 217
- Woodrowia*, 323
- Xantolis*, 209
- Xiphagrostis*, 329
- Xylia*, 208
- Zalitea*, 209
- Zea*, 379
- *Mays*, 379
- Zoophthalmum giganteum*, 190
- Zygophyllidium*, 209





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## CONTENTS OF NO. 4

THE GRAMINEAE-PANICOIDEAE OF NEW GUINEA. (Concluded). By <i>John R. Reeder</i> .....	321
STUDIES IN THE THEACEAE, XVII. A REVIEW OF THE GENUS <i>BONNETIA</i> . By <i>Clarence E. Kobuski</i> .....	393
ADDITIONAL NOTES ON THE CONVULVULACEAE OF NEW GUINEA. With one plate and one text-figure. By <i>S. J. van Ooststroom</i> .....	414
DESCRIPTIONS OF NEW CHINESE PLANTS. By <i>Faith Chun</i> .....	419
THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1948	422
BIBLIOGRAPHY OF THE PUBLISHED WRITINGS OF THE STAFF AND STUDENTS, JULY 1, 1947-JUNE 30, 1948.....	426
STAFF OF THE ARNOLD ARBORETUM, 1947-1948.....	429
INDEX.....	431
TITLE-PAGE AND TABLE OF CONTENTS.....	i-iv

---

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